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H. C. PARMELEE, Editor

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Dayton Meeting of the American Electrochemical Society

FOR many reasons Dayton was a logical meeting place for the American Electrochemical Society. Of the city's three significant contributions to the engineering and industrial world—the airplane, the automobile ignition system and the cash register—all have been in a large degree dependent upon electrochemistry. Duralumin and the other light, strong alloys that go to make up the airplane and its power plant, the automobile engine, come from the electric furnace. Many of the problems of automotive research being studied at the General Motors Research Corporation have proved of an electrochemical nature. And the plant of the National Cash Register Co. boasts of the largest electroplating operations in the world. The electrochemists had reason, therefore, to feel at home among such surroundings, and it is perhaps natural that we might expect the Dayton meeting to set new records of technical service.

The convention accomplished two commendable purposes. First, by means of its unusually comprehensive symposium on the electrochemistry of gaseous conduction it enabled the electrochemist to acquaint himself with the great advance the physicist has made during the last 5 or 6 years in bringing the X-ray and the radio to their present stage of development. This progress has been so rapid and the terminology and and nomenclature have become so involved as to discourage the average worker even along closely related lines. Many of our older notions must be revised. The ionic theory of Arrhenius that has been so successfully applied in developing the electrochemistry of solutions is of extremely limited utility in this field. Entirely new methods of attack are necessary before we can hope greatly to enlarge on the very few present industrial applications of the electrochemistry of gases.

The second achievement came with the round-table discussions, the first of the kind to be attempted by any of our scientific societies. The friendly atmosphere that pervaded these group luncheons helped to break down the usual resistance to free and informal discussion among technical men. For instance, in the group on electric furnace brass foundry practice there was a wholesome airing of opinions. The furnace users talked frankly to the furnace makers about their operating difficulties. In the electrodeposition discussion the practical platers told the electrochemists that help was needed in solving some of the fundamental operating problems of electroplating and that the chemist should no longer be content to busy himself with minor refinements in analytical technique. The organic electrochemists took account of their stock in trade and discussed the possible commercial developments in this practically unexploited field. Likewise in the round-table discussion of chlorine both producers and users joined in considering new avenues of consumption for this important electrochemical product. The showing made by these gatherings, particularly in the case of the brass foundrymen where more than a hundred met for several hours of debate and discussion, proved conclusively the value of the round-table plan of meeting.

But after all the successful symposium and the group meetings were only added features of the convention. The general technical sessions, the smoker and "Section Q" entertainment, the golf tournament and the interesting excursions to the industries of the district were carried out with the vigor and enthusiasm that have won for the society its enviable reputation among scientific and technical organizations.

Co-ordination of Corrosion Research

CORROSION is undoubtedly the greatest single cause of loss or damage in metal equipment and metal structures. Yet the phenomena of corrosion are perhaps the least understood and the least easily controlled of the problems with which the chemical engineer has to contend. That these are well-recognized facts is evident from the large amount of research and investigation conducted through a wide variety of agencies on electrolytic corrosion, soil corrosion, chemical corrosion and the other varieties innumerable. But worst of all, this investigation seems to have gone forward almost without co-ordination among workers or methods employed.

About 10 years ago the national Bureau of Standards recognized this fact with reference to the corrosion problems involved in electrolytic damage to public-utility structures such as water piping, gas-distribution systems, electric cables and underground metallic telephone equipment of all types. The result was the formation of a committee representing all of the principal utility associations. That committee has functioned as an advisory board to the Bureau of Standards and has assisted in many cases in the co-ordination of research work and the study of specific local problems. As a result, there is today a vast fund of well co-ordinated information from which it is safe to say a practically complete code of engineering practice for prevention of electrolytic damage to public utility structures can be prepared. Indeed, the work has advanced so far that the bureau is seriously considering the possibility of rounding out final publications and closing up the active experimental work on these utility problems during the next year or two.

The situation with respect to soil corrosion and the corrosion of chemical and other engineering equipment

and machinery is very different. There has been no systematic co-ordination of research work. And there certainly is no established fund of information on which the chemical engineer can work either for his own guidance or with the surety that he has evidence thoroughly convincing to parties at interest in any corrosion controversy. Nor is there any evident reason why some broad scheme for the co-ordination of this corrosion research should not be established.

The experts of the Bureau of Standards have proved their skill as scientists as well as their tact and diplomacy. Why should not that institution take the initiative in the present instance, and offer to act as a co-ordinating body with respect to information already available or research that should be undertaken? With an advisory committee selected from the National Research Council, the American Electrochemical Society, the American Society for Testing Materials and the American Institute of Chemical Engineers, the bureau would be in a position to do for private industry what it has done for public utilities. A conference of all parties in interest at the bureau would disclose what opportunity there may be for such a plan of co-operation, and should be productive of a clearer understanding of the problems confronting the industries. Finally, it might lead to the establishment of an informal agency through which the various committees now at work could clear their ideas and exchange experiences. We make the suggestion in the interest of more rapid progress.

Why Radicals Thrive

ONE of the fond frailties of human nature is to indulge in complaint and fault finding with the way the world wags, without taking any constructive steps to remedy the offending condition. Such is the habit of the cracker box politician at the country cross-road store. Unfortunately, however, the custom is not confined to this class, but finds expression in the highest strata of organized society. Ask any respectable and conservative banker or business man how he feels about the spread of radical ideas on social and political questions, and he will promptly deplore their dissemination, particularly in quarters where he would not expect to find them favorably received. But ask this same individual what he is doing to counteract the influence of these ideas, and the chances are more than 100 to 1 that he will have to admit that he has done and is doing nothing. And therein lies a large part of the answer to the ease with which radical ideas get a foothold. The apathy of conservatives is quite as much responsible as the activity of radicals.

A striking example of this condition came to our attention a short time ago in connection with radical talks that have been given before a student organization in an Eastern women's college. A prominent leader in the chemical industry met the young lady who is president of the student organization and asked her why only radical speakers appeared on their program. To his surprise she replied that they had invited conservative bankers and substantial business men to address them, but that these individuals were too busy to accept. The radicals, on the other hand, were always glad to come and preach their doctrines.

How shall we consistently complain of the growth and acceptance of radical ideas, particularly among the younger generation, when business absorbs our time and attention to the exclusion of an obvious duty of citizenship? A group of bright, intelligent students offers the most fertile ground for implanting sound ideas on modern political, economic and sociological questions, and in our judgment an invitation to address such a body carries with it an obligation that cannot be denied. To neglect it is to encourage the parlor bolshevist, the pink socialist and even the reddest radical to take advantage of an opportunity to spread his doctrines. The obligation rests quite as heavily on engineers and technical men as on bankers and business men, and we express the hope that none of these will neglect so obvious a duty if the opportunity comes. Otherwise a conservative majority must not complain of an active minority.

Rigid Economy

The Need of Industry

RECENTLY we had the pleasure of indulging in a social hour with an engineer friend who has had a wide and varied experience in the chemical and metallurgical industries. Talk turned on the deficiencies of our growing chemical industry, and he ventured the opinion that what we need is rigid economy and close attention to business details. The old-time successful captains of industry, he reminded us, were noted for their thrift. There was the late James J. Hill, for example. He abhorred waste; and many a foreman, superintendent or storekeeper was taken to task if rails, ties, nuts and bolts were found lying around. Hill insisted that there be a place for everything and he wanted to find things in their places.

Another instance was recalled of a mine owner, who shall be nameless in this chronicle, who died a few years ago after having accumulated an estate of about eight million dollars. He was Scotch by birth and naturally thrifty. In the early days before the railroad came to his district, wood was the principal fuel at the mines. And it is recorded in traditional stories of our canny Scot that he even watched the length of time the whistle was blown at the shaft house. On one occasion he took the engineer to task for blowing the whistle too long. "Don't blow it so long," said he, "It takes steam to blow that whistle; it takes wood to make steam, and wood costs money."

Economy is often lost sight of in rush jobs. The man that every manager or superintendent should watch carefully is the foreman who is always coming in with a "rush" requisition. It generally means an express shipment, which increases the cost materially. Furthermore, it is not uncommon in such cases to find materials and equipment ordered on "rush" requisitions unused for several months after their arrival. Again, many a stores requisition would never be made out if the cost of the items were known. For this reason our friend has made it a practice to furnish each department head with a duplicate copy of every stores requisition with prices attached, so that there could be no alibi in case a superintendent were called to account for excessively high costs.

Rigid economy should be made a watchword and slogan in the plant, because a reduction in cost may be the quickest means of insuring a profit. A national campaign for greater thrift in industry would be productive of as much good as has followed the "Safety First" movement.

Co-operation for Better Plant Equipment

PRACTICAL development of the chemical engineering industries is limited by the extent to which appropriate equipment is available. There are, today, technical processes of merit that are unused because there is no equipment for operating them economically on a commercial scale. Conversely, there is equipment on the market that doubtless would find application in industries other than that for which it was developed, were its possibilities only known. Being thus a determining factor in the development of industry, the evolution of equipment to planes of higher perfection and wider utility is of intimate concern to every plant operator and equipment maker.

It is self-evident that the closer these two groups, maker and user, come together the better will their respective interests be served. The fault today is about equally divided between them. Instances are not lacking in which plant operators have developed equipment superior to that furnished by a manufacturer or have adapted standard equipment to hitherto unknown uses, largely because the equipment maker did not keep posted on process details and prospective demand for improved machines. Then again, the wide-awake manufacturer is more often than not hampered in developing improved designs or apparatus for new processes by unnecessary secretiveness on the part of the plant man as to his process.

Co-operation of all interested in the development of chemical engineering equipment must exist if the highest attainments are to be reached. Maximum progress will require constant search by both sides, on the one hand to make known new needs and on the other to extend the service of equipment already developed.

It Can Be Done

ARE you up against an unsolvable problem? A problem that the whole industry has tried to solve and failed? A practical psychologist, who probably would not acknowledge the title, has proved to us that a shift of the viewpoint can do wonders in such a case.

A young friend of ours who is an amateur photographer was graduated in chemical engineering during the war, and needing some metol, a German organic developer which it was impossible to purchase at that time, he set about making some. It took most of his spare time for many weeks, but he succeeded in producing a yield of excellent quality. Afterward, on discovering that American chemists had tried for years without success to duplicate the German product, he manufactured the developer on a commercial scale until the German product again appeared on the American market at a very low price.

This young man admits that if he had known it was considered impossible to make metol without using certain raw materials known and obtainable only in Germany, he would not have persisted in his attempts. But he thought it would be a disgrace to fail in his undertaking—and he succeeded! He has been remarkably successful since in solving difficult research problems, and part of the reason is that he voluntarily erases from his mind the feeling that "many men have failed to do this thing, so I may be excused for failing." He persuades himself that he does not know that the problem is terribly abstruse.

It is difficult to pass on to the next fellow the benefits of this experience without appearing to preach, but believe us when we tell you that time and again we have seen in this psychological stratagem the direct cause of success.

Integrating Industrial Processes

ONE of our earliest memories centers about a cartoon appearing in a humorous weekly depicting a dog jumping into the hopper of a mysterious machine from which he was almost immediately discharged in the form of link-sausage. This was our first acquaintance with the fully integrated industrial process. While our original interest was not untinged with concern for the dog, the memory that remains is of the marvelous machine, which performed within its small compass, automatically, work which any child knew ordinarily required much apparatus and many men.

Perhaps because of this cartoon, the integrated industry has always fixed our attention. To take in raw materials at one end of the factory and to deliver from the other finished goods, stopping meanwhile for no hand labor to be performed on the material or because of it—that is an ideal and one fraught with possibilities of economy. In such a plant the process equipment and the handling machinery work as a synchronized whole. The result is almost attained in certain cases, notably the paper mill and the sugar refinery. In these days of scarce labor and rapidly developing technical skill, the idea is one that could well receive more attention from industry than it has in the past.

Short Weight In Chemical Packages

ELSEWHERE in this issue is a news report on discoveries of serious shortage in weight of reagent chemical packages. It is to be hoped that the circumstances described by the Bureau of Standards are simply an unfortunate accident resulting from wrong labeling of 1-lb. analyzed chemical containers as if they contained the metric quantity of 500 grams. The two quantities differing by only 10 per cent make such a mistake quite understandable; but the frequency with which the bureau has experienced this difficulty indicates carelessness that may be interpreted as dishonest practice.

It was a distinct step forward accomplished by the A.C.S. committee on guaranteed reagents and standard apparatus when arrangement was made with chemical dealers to supply material in metric units—100 grams, 500 grams, 1 kilogram, and the like. But any such step forward must not be made at the expense of careless or fraudulent labeling of 1-lb. and 2-lb. containers as if they were 500-gram and 1-kg. packages. The Bureau of Standards does well to suggest that other purchasers of reagent chemicals check up on deliveries they are receiving. It would also be well if chemical dealers would check up on packages which they are offering for sale, before they are shipped, not after complaint is received from the purchaser. The good name of the chemical distributors of the country will be at stake until all these accidents have been surely eliminated.

A Distinguished Jurist

The Suit Brought by the Government Against the Chemical Foundation Has Been Involved and Difficult—Judge Morris' Conduct of This Case Is Notable and His Decisions Precedent Making

TO THE chemical engineer looking over the bar, law appears to be a baffling game, with only vaguely defined head or tail. He has trouble in understanding the why and wherefore of such a trial as has been staged in Wilmington during the past summer by the United States Department of Justice over a suit brought by the government against the Chemical Foundation. Technical legalities obscure the issue.

Judge Hugh M. Morris, who has heard the case, has shown himself to be a man of remarkably sound judgment. His has not been a pleasant task. Nor is it yet fully accomplished, for the last arguments still remain to be heard. However, the major decision in the case would now appear to be of secondary importance to the industry at large as compared with the rulings which the Judge has handed down during the assembling of testimony.

Of these decisions the most far reaching, as establishing a precedent, seems to be with regard to the revelation of trade secrets. In this connection he says: "It seems to me that if on a matter which here is of relatively slight moment, in order that the witness may tell whether his patent is workable or not, he is required to disclose, not his secrets but the secrets of his employers, secrets upon which the business of this company is mainly built — as the witness tells us — it seems to me that the administration of justice could be very readily brought into serious disrepute, where, instead of aiding this administration of justice, those engaged in the business would desire to avoid courts of justice in every conceivable and possible way."

Was the Chemical Foundation in its formation based on a conspiracy? Thus the Judge: If the government succeeds in establishing fraud in this case and a full disclosure of all the facts amounting to fraud was made to the government officials before those officials acted, the inevitable conclusion would be that the grossest fraud was committed by the government officials rather than by the persons engaged in the industry."

Was the price paid for the patents, $250,000 for about 4,600 of them, inadequate? This was a question involving their workability and application to American industry by American technologists. Having heard the most conflicting testimony possible, Judge Morris decided to find out for himself what the facts were. So he ordered an actual test in Swarthmore laboratories of the highly disputed cincophene patents. He insisted on data recorded by court observers. And he obtained it!

For a man of law, not expert on points of chemistry and engineering, Judge Morris' words throughout the trial were filled with a sympathetic understanding of the action and reaction involved in the various questions entering into the testimony.

Hugh M. Morris

Presiding Judge in the trial of the United States against the Chemical Foundation

Nitrogen fixation, salvarsan, rare pharmaceuticals, dyestuffs could at best mean far less to the Judge than the basic questions of law involved. Yet in listening to the testimony with regard to valuation of the patents in dispute, he demonstrated a remarkable understanding of the factors entering the question, both technical and otherwise. His differentiation of relevant from irrelevant facts was unusual.

Whatever the outcome of the trial, and it is expected to be appealed to the Supreme Court of the United States for final decision, we cannot fail to recognize in the young, genial man a degree of honesty, courage and common sense that was fortunate for the industry.

American Electrochemical Society *Establishes* New Records of Technical Achievement

Forty-fourth Meeting in Dayton Is Featured by Comprehensive Symposium on Gaseous Conduction and Four Informal Round-Table Discussions on Brass Foundry Practice, Electrodeposition, Organic Electrochemistry and Chlorine Utilization

EDITORIAL STAFF REPORT

DAYTON, OHIO, played host to the American Electrochemical Society for its forty-fourth meeting, Sept. 27, 28 and 29, 1923. The unusual engineering and industrial developments of the district, all closely related to electrochemistry, formed a fitting background for one of the most successful conventions in the society's history.

The outstanding features of the meeting were the symposium on the Electrochemistry of Gaseous Conduction and the informal round-table discussion, both of which proved to be very popular. The local committee, under the able guidance of H. M. Williams and E. H. Kramer of the General Motors Research Corporation, planned a series of trips to neighboring plants, a golf match in which T. F. Baily and R. W. Milnes distinguished themselves, a delightful smoker and entertainment at Triangle Park and a visit to McCook Field and the Miami Conservancy.

The ladies were the guests of the Duriron Co. at the Polo Hunt Club on Thursday, and on Friday Mrs. Edith McClure Patterson entertained them royally at the National Cash Register's plant. They also visited the home of the aged mother of the famous negro poet Paul Lawrence Dunbar.

After formally opening the first technical session President A. T. Hinckley introduced Charles H. Paul, president of the Engineers' Club of Dayton, who welcomed the society and pointed out some of the most noteworthy features of the town. The Engineers' clubhouse, where the subsequent sessions were held, offered surprising proof of what a clubhouse, designed and built by engineers for engineers' use, can provide in utility, convenience, comfort and beauty.

WHAT CAUSES WATER-LINE CORROSION?

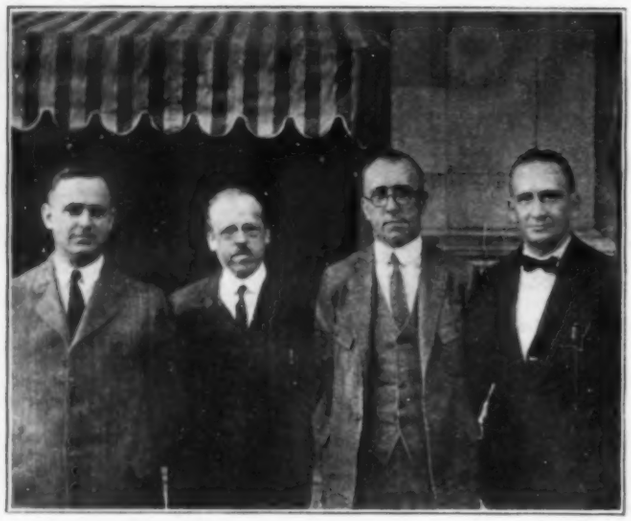
Kenneth M. Watson of the University of Wisconsin had investigated the cause of water-line corrosion and reported that he had found that it was not primarily due to the action of the air or oxygen. This phenomenon, he believed, is caused by the slow downward flow of the heavier film of corrosion products along the surface of the metal, which draws in at the upper surface of the liquid a supply of fresh solution. Since all the metal except that at the surface of the liquid is in contact with partly exhausted solution, corrosion is most rapid at the surface. This paper, which brought forth considerable very interesting discussion, will be published in a subsequent issue of *Chem. & Met.*

Commenting on Watson's theory, Dr. H. C. P. Weber of the Westinghouse company felt that the concentration of the corrosive agent at the solution line should be taken into account. C. J. Rodman referred to tests on electrolytic condensers at the Westinghouse plant in which the substitution of nitrogen for oxygen did not eliminate the water-line corrosion. Dr. Colin G. Fink pointed out that the water-line corrosion Professor Watson had observed in an atmosphere of hydrogen might very well be due to the spray effect caused by the bursting of the fine oxygen bubbles escaping from the anode. The constant bombardment of the anode with fine drops of electrolyte directly above the solution line will bring about necking that can be almost entirely eliminated by covering the electrolyte with a thin film of paraffine oil. W. B. Schulte of the Burgess Laboratories, Madison, stated that as yet no satisfactory method had been found to do away with water-line corrosion or "cutting away" of the zinc cans of dry cells.

Prof. M. A. Hunter of the Rensselaer Polytechnic Institute has been devoting years of study to the production of pure metals by the reduction of their chlorides by sodium. His work on titanium is familiar to all. The present paper covers work which was carried out together with A. Jones of the Driver-Harris Co. on the production of metallic Zr, V, U, Cr and Be. Of particular interest is metallic beryllium, the production of which in a pure form Dr. S. C. Lind characterized as a decided triumph. The metal recovered contained 99.6 per cent Be, had a silver-like luster and when cold could be flattened easily under the hammer. The specific gravity was 1.79, the melting point 1,370 deg. C. The metal is insoluble in cold concentrated nitric acid.

The Pacific Experiment Station of the U. S. Bureau of Mines has been investigating the possibilities of using the air electrode in place of the hydrogen electrode. George S. Tilley and Oliver C. Ralston submitted a detailed report on the results obtained so far.

Three papers of the session covered in brief some



Left to right—E. H. Kramer of the local committee. Dr. Colin G. Fink, secretary. A. T. Hinckley, president of the American Electrochemical Society. Dr. H. B. Wahlin, University of Wisconsin.

of the very extensive research that has been carried out at the Pittsburgh laboratories of the Westinghouse company. "The Composition and Aging of Insulating Varnishes," by H. C. P. Weber, emphasized the fact that during the drying and oxidation of varnishes, conducting materials are formed which produce appreciable lowering of the electrical insulation resistance. The greater the amount of linseed oil in the varnish the lower is the resistance after aging. For most varnishes the oxidation increases up to about 96 hours, but after that it is practically complete, when the film is thin. Linseed oil varnishes are the most acid. China wood oil varnishes develop less acidity than the linseed oil varnishes.

"The Effect Produced by Aging in Synthetic Resin Molded Products of the Phenol-Formaldehyde Group" were reported upon by E. J. Casselman. In molded products the phenol-formaldehyde resins serve as binder for fibrous material such as paper, duck or asbestos. The synthetic resin often contains volatile impurities. During aging these impurities escape: the electrical properties improve and other changes that occur are slight and of little significance.

"The Effect of Continued Heating on the Power Factor and Resistance of Impregnating Compounds" has been investigated by D. E. Howes. A large number of field coil windings were impregnated with four kinds of compounds, and heated at temperatures 105 deg., 125 deg. and 150 deg. C. for a period of 120 days. Even though considerable oxidation took place, the electrical properties continued to improve throughout. The results show that continued heating at these temperatures, while it does not seriously affect the electrical properties of the insulation, does destroy its practical value, due to its mechanical deterioration. The electrical resistance of Bakelite-impregnated coils was much greater than any of the gums and the power factor much less. This is because it does not soften.

In the discussion following these "insulation" papers E. E. Stark and H. B. Wahlin referred to the surface leakage of molded Bakelite products and the improvement of the electrical resistance by coating the surface with molten sulphur. C. G. Fink and H. C. P. Weber called attention to the use of molded Bakelite products as acid and alkali containers. Cells built up of Redmanol board withstood the action of sulphuric acid solutions almost indefinitely. C. P. Madsen made the interesting observation that nickel could be deposited on Bakelite from an aqueous solution. Dr. Blum of the Bureau of Standards found appreciable quantities of phenol in acid copper baths when using Bakelite immersed in the bath. Dr. Lind of Washington suggested a possible use of the electroscope for testing high electrical resistance.

Electrochemistry of Gaseous Conduction

Friday morning and afternoon were given over to a symposium on the electrochemistry of gaseous conduction. It constituted the main attractive feature of the technical program and comprised highly learned contributions from the first laboratories of the world. Beside the papers from the American industrial and university laboratories, there were papers from Holland, England, Germany and Canada. Dr. Duncan MacRae of the Westinghouse Lamp Co. presided and it was largely due to his untiring efforts that the symposium will long be remembered as one of the most interesting and fascinating ever held by the society.

The opening paper was entitled "The Electrochemistry of Gases," by Dr. S. C. Lind of the Bureau of Mines. Dr. Lind advanced a number of new principles supported by recent electronic evidence. One of these is that gas ions tend to form addition products with neutral molecules, which complexes are the intermediate products of gaseous electrochemical reactions.

The next two papers were studies on the "Disappearance of Gas in the Electrical Discharge Tube," one by Prof. F. H. Newman of University College, Exeter, the other by the Research staff of the General Electric Co. of London. Newman, on the basis of a long series of tests, concludes that the disappearance of residual gas in the tube is due to the formation of less volatile chemical compounds, but the G. E. Co. is inclined to look upon the clean-up by phosphorus as due to the adhesion of the gas to a film of solid deposited by the discharge. Dr. Saul Dushman of Schenectady discussed the "Theory of Electron Emission" in the light of modern views. Prof. K. T. Compton of Princeton submitted a treatise on the "Ionization and Activation of Gases." The subject was discussed in detail by Dr. F. G. Cottrell of Washington. Prof. H. A. Wilson of the Rice Institute, Houston, presented a paper on "Electricity in Flames," and A. E. R. Westman and W. J. Clapson of the University of Toronto reported their latest results in the study of the "Relation Between Current, Voltage and the Length of Carbon Arcs." D. McFarlan Moore of the Edison Lamp Works, Harrison, described his new "Low Voltage Gas Filament Lamp," which can be operated on 110-volt circuits.

The final paper of the morning session, on the "Electrochemistry of the High Intensity Arc," was by Dr. Preston R. Bassett of the Sperry Gyroscope Co., Brooklyn. The paper aroused a great deal of interest. Sperry's Ce C_2 arc has an intrinsic brilliancy of 1,500 cp. per sq.mm., as against 100 for the large gas-filled tungsten lamps. The arc lamp was demonstrated to the members.

Ozone and Nitric Oxides

The afternoon session was devoted largely to papers on the production of nitric oxides and ozone by electric discharge. Prof. F. O. Anderegg of Purdue treated the "Surface Complications in Corona Discharge," and

Dr. A. Guenther-Schulze of the Reichsanstalt, Berlin, submitted a detailed study on the "Influence of the Shape of the Cathode on the Normal Current Density of the Glow Discharge." Then followed a paper by Frank E. Hartman, of the United States Ozone Co., on "The Production of Ozone With High-Tension Discharges"; Karl B. McEachron, of the General Electric Co., discussed the "Production of Nitric Oxides and Ozone by High-Voltage Electric Discharges," his paper being a summary of the work reported in full in Bulletin 9 of Purdue University.

The U. S. Fixed Nitrogen Research Laboratory and Bureau of Soils, Washington, presented a report on the "Heat Losses and Chemical Action in the High-Voltage, High-Frequency Discharge Through Air, the research having been carried out by Farrington Daniels, Paul Keene and P. D. V. Manning. Approximately 45 per cent of the total energy supplied to an oscillation circuit of the Tesla type was evolved as heat in a large discharge chamber containing air. Approximately 1 per cent of the total energy was used in chemical action. "The Formation of Gaseous Ions in the Oxidation of Nitric Oxide" had been investigated by A. K. Brewer and F. Daniels at the University of Wisconsin. They found that the current is directly proportional to the voltage and to the number of molecules reacting. No evidence of a saturation current could be detected. Dr. L. Hamburger of the Philips Lamp Co., Eindhoven, Holland, contributed a 60-page treatise on the "Relations Between Supplied Energy, Spectral Intensities and Alterations in Different Media."

A fitting closing of the symposium was the fascinating illustrated lecture by Prof. H. B. Wahlin of Wisconsin on the Electrochemistry of Gaseous Conduction held at the Engineers' Club Friday evening.

Electrodeposition of Metals

During the last half-dozen years very carefully conducted researches have been carried out with a view of determining the exact nature of electrodeposited metals, in particular as to the physical characteristics, and what factors there were that influenced or modified the shape or form of the metal deposited. George B. Hogaboom was among the first to call attention to the change in structure of the deposited metal with a change in structure of the underlying metal serving as a base. Some of the very latest findings were reported upon by Dr. William Blum based on tests which he and Dr. H. S. Rawdon carried out at the Bureau of Standards. They now advance the simple theory that, in most cases at least, the ion discharge and the metal crystallization constitute one and the same process: "The neutralization of a given metal ion takes place upon the cathode surface, at a point at which the lowest discharge potential is required. This discharge potential at any point on the cathode is determined by (*a*) the effective metal ion concentration of the adjacent solution, and (*b*) the solution pressure of the metal at that point, which is determined in part by the orientation of the adjacent atoms."

Dr. A. Kenneth Graham of the University of Pennsylvania investigated the relations existing between "The Microstructure of Metal Surfaces and the Electrodeposits Made Thereon." A series of very instructive microphotographs were shown in support of Dr. Graham's conclusions.

The paper by Blum and Rawdon and that of Dr. Graham were enthusiastically received and it was the consensus that decided progress is being made along lines of fundamental importance to the electroplating art. E. C. Bain referred to his X-ray examination of metals. All electrodeposited metals he examined were thoroughly crystalline and the grain size varied over a range quite comparable with that of the ordinary metals solidified from the molten state.

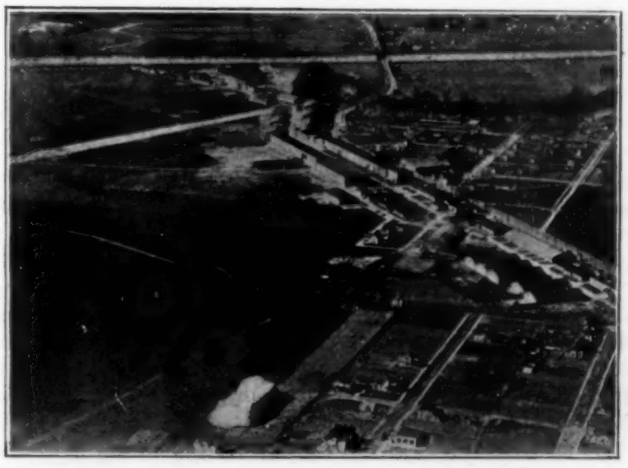
A. H. Heatley presented a new mathematical analysis and theory of the current distribution in electroplating baths. The research was carried out at the Electrochemical Laboratories of the University of Toronto.

M. Knobel and D. B. Joy gave an account of experiments carried out at the Massachusetts Institute of Technology on the effect of temperature on cathode overvoltage.

Chromium Plating Steel

K. W. Schwartz had investigated the various solutions proposed in the past for the electrodeposition of chromium. Good, adherent deposits of chromium on iron were obtained, using solutions containing 3 grams per liter chromium sulphate and from 200 to 400 grams per liter chromic acid. The cathode current density range for good silver-bright deposits was found to be from 9.3 to 16 amp. per sq.dm. Chromium anodes in the above solution show no tendency to become passive even after long and continuous plating operations. Chromium anodes are cheaper than platinum and better than lead. The simultaneous evolution of hydrogen with chromium deposition on iron is essential to good results. The hydrogen appears to protect the freshly discharged metal, and to counteract the great tendency of chromium to pass back to the chromous ion stage. Chromium-plated steel has a hard, bright, silver-like surface that resists atmospheric corrosion indefinitely. It is also resistant to the action of fumes of nitric acid, hydrogen sulphide and ammonia, and the corrosive action of molten tin, zinc and brass. Steel does not lose its temper during chromium plating. Chromium-plated iron does not resist electrolytic (anodic) corrosion in mineral acids.

In the discussion of Mr. Schwartz's paper Dr. Fink referred to the relative ease with which chromium oxide is reduced to metal electrolytically as compared with reduction by hydrogen or carbon. Properly annealed, chromium-plated steel becomes soft and pliable. The



McCOOK FIELD, ENGINEERING DIVISION, U. S. AIR SERVICE

What Do You Know About Research?

Charles F. Kettering, president of the General Motors Research Corporation, knows industrial research and he knows technical men. What he had to say on the subject of research at the Dayton meeting of the electrochemists is of interest to every man in the chemical engineering industries. Here are a few characteristic sentences from his sparkling address:

Any industry—more particularly its technical men—will accept anything new provided it is like what they've been getting before.

What we need is a correlation among the so-called sciences. All of us are studying merely the relations of mass and energy. Physicists, chemists, engineers and astronomers are working along the same lines, but talking four foreign languages.

Research wouldn't be research if we didn't try everything but the right thing. The only time it's disgraceful to fail on a research is the last time.

Standards are likely to be stakes that tie an industry down. The most standardized operations are usually the most profitable for investigation.

In one-fourth of a second we can send a message to a man on the other side of the globe, but it may take 20 years for that message to get from his ear to his brain.

Research is the "if" problem in your industry; study the thing that reflects in your bank account. The greatest stimulus to individual research is to have a competitor take a good piece of business away from you.

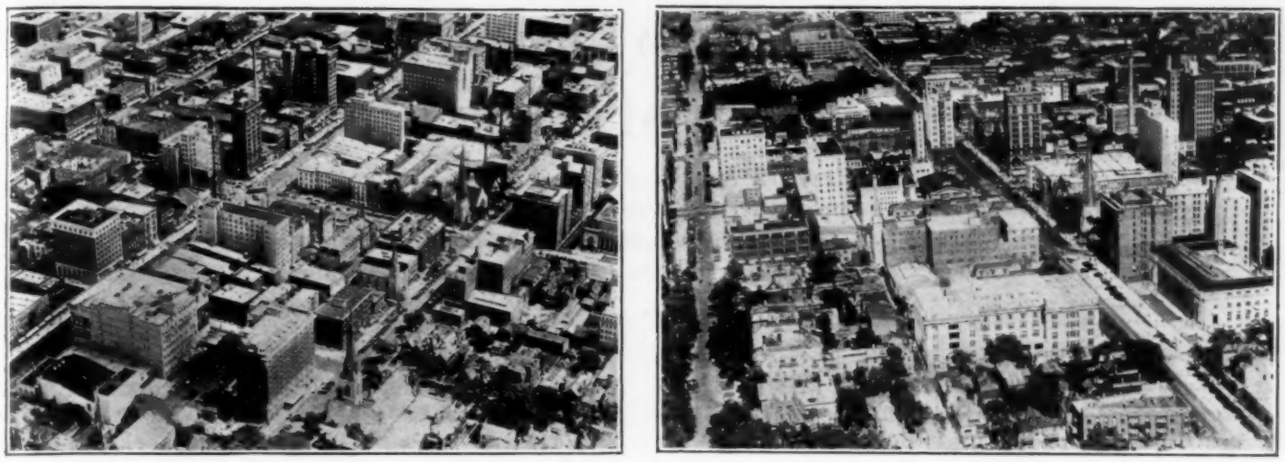
I have no use for a researcher if he can't analyze his problem into its probabilities and study it systematically. Of course you can stumble onto things when you're not watching. My explanation is that the Lord gets so tired of watching you blundering around that he pushes you into the solution for your problem. Then you reduce it to mathematics and that's the way you write it up in your paper. But you yourself know that's not the way you got it. You stumbled onto it!

investigation on chromium plating is being continued at Columbia. Dr. E. A. Richardson of the Westinghouse company described their experiments on chromium plating nickel-steel wire by a continuous plating and annealing operation. The plated wire can be drawn to very fine sizes. They agree with Schwartz as to the best working solution and find 75 amp. per sq.ft. the most serviceable current density. The addition of H_2SO_4 to the bath was not as good as the addition of chromium sulphate. The deposit is silver bright. The value for the coefficient of expansion was found to be 95 as against 94 found by Disch of the Reichsanstalt 2 years ago and 89 for ordinary glass.

H. D. Hineline reported that according to his experience the resistance to corrosion of chromium-plated steel is greater after heat-treatment. Dr. C. J. Thatcher of New York referred to the appreciable amounts of chlorine evolved during the early stages of the electrolysis of chromic acid solutions and suggested that this may account for the irregular behavior of a new bath as mentioned by Fink and Richardson. O. L. Barnebey of Columbus commented at length on the important commercial bearing of chromium-plated steel and pointed out that for the use of furnace parts an entirely new field had been opened up. James Kelleher of Niagara Falls suggested a possible use of chromium-plated steel for strong alkali solutions or fused alkalis. Mr. Braid of the Thermit Metal Corporation mentioned that their chromium metal, such as used by Schwartz, averages 98 to 99 per cent Cr. S. E. Sheppard and A. Ballard of the Eastman Kodak Research Laboratory obtained chromium deposits on brass of steel gray color using Liebreich's bath (*Z. Elektrochem.*, 1921, vol. 27, p. 74). The voltage was 6.0 and the current was 121 amp. per sq.ft. The anode was graphite inclosed in a canvas bag. James A. Aupperle of the American Rolling Mill inquired as to whether the exposure of the steel under a thin coat of chromium would accelerate corrosion, as in the case of thinned iron, or whether the exposed surface would heal over, as in the case of galvanized steel. In answer, Dr. Fink referred to tests by Lewis and others on the submersion of bright steel in chromate solutions. The steel remains bright indefinitely. Dr. Blum discussed the theory of chromium plating and supported Sargent in his views.

Electrolytic Zinc Progresses

One of the few metallurgical "war babies" that has come to stay is the electrolytic deposition of zinc from solutions obtained by leaching roasted zinc ores. Anaconda's large plant is familiar to all. Another large plant is located at Trail and a third one at Hobart, Tasmania. It is interesting to note that the ores of the new Rhodesian project are mainly silicates of zinc, where the whole of the silicate is soluble and from which high-grade spelter has been produced by the electrolytic process. Samuel Field and William E. Harris, realizing the importance of cheapening the process of purifying the zinc electrolyte, carried out a long series of tests at the works of the British Metals Extraction Co., Swansea, and at the Northampton Polytechnic Institute, London. They presented at the Dayton meeting their findings to date on the "Use of Mercury in the Purification of Zinc Sulphate Solutions." The tests were at first carried out on a laboratory scale but later on a semi-commercial basis of 1.5 tons of zinc per day, using as raw material a wide variety of ores. The crude zinc sulphate solutions contain, besides zinc, Cu, Cd, Fe, Ni, Co, As, Sb, Mn, Al, Mg, V, Ca, Cl, NO_3, and PO_4 according to the type of ore leached. Field and Harris add a previously calculated quantity of mercuric sulphate to the solution, the proportions being about 0.01 per cent Hg, just previous to adding the Zn powder. The Zn powder next added is from 0.1 to 0.15 per cent of the solution, and as the whole is agitated and heated to boiling the impurities will be seen floating, like a black scum, on the top of the solution. As soon as it is free from Ni, Cu and Cd the solution is pumped through the filter press to storage tanks ready for electrolysis. In discussing the method suggested by Field and Harris, C. A. Hansen referred at length to the tests and commercial operation he conducted at Park City during the war. He found the treatment of



TWO AIRPLANE VIEWS OF THE BUSINESS DISTRICT OF DAYTON

zinc plant solution with zinc to be expensive and inefficient. The mercury purification method has the extreme merit of being easily tested without heavy investment in equipment. Dr. Fink of Columbia University felt that electrolytic zinc was merely at the very beginning of its career. Research that he together with E. W. Hale had been carrying out proved that zinc by electrolysis would some day be as simple as copper. Dr. Richardson of the Westinghouse company described briefly experiments on the recovery of zinc from brass and german silver scrap. The presence of the nickel made it commercially impossible to get good adherent deposits of zinc that would "stay put." Professor Mathers of Wisconsin emphasized the difficulty in determining small amounts of impurities in zinc solutions.

Prof. Louis Kahlenberg and J. V. Steinle presented a very learned contribution "On the Single Potential of Arsenic and Its Power to Replace Other Metals in Solution." Silver will replace arsenic and vice versa, depending upon conditions, but neither Fe, Ni, Co, Cr nor Mo will replace arsenic to a notable extent under any conditions. The single potential of As (vs. calomel electrode = 0.577 volt) was found to be 0.55 in a $AsCl_3$ solution of 1 gram equivalent of As per liter; and 0.54 v. in a corresponding solution of AsI_3.

Round-Table Discussions

During the noon hour Thursday four informal round-table discussions were held. One on Electric Brass, another on Chlorine, a third on Organic Electrochemistry and a fourth on Electrodeposition. The one on electric brass was the most popular and more than 100 members and guests participated. It was the first opportunity offered by any society for the central station interests to establish intimate contact with their prospective customers. The table was presided over by Dr. H. W. Gillett. Much valuable information was interchanged. At the conclusion of the discussion P. A. McTerney demonstrated the operation of the Weed furnace with a small model. Walter Fraine of the National Cash Register Co. was chairman of the Electrodeposition Round Table. Subjects such as the co-operation with the government laboratories, corrosion-resistant coatings, stripping of plated metals, filtration of large volumes of electrolyte, and plating aluminum and aluminum alloys were brought up for discussion.

Representatives of a number of the chlorine-producing companies as well as users of this product participated in the round-table discussion on the utilization of chlorine. A. H. Hooker of the Hooker Electrochemical Co., Niagara Falls, N. Y., acted as chairman. For economical production it is obvious that chlorine production should be on a continuous and uniform basis. Some of the best-known uses that might accomplish this purpose include: The production of zinc chloride for timber preservation and fireproofing, the production of a pure grade of ammonium chloride, particularly adapted to the growing needs of the dry battery industry, and the production and use of anhydrous aluminum chloride for oil cracking and for general synthesis. Mention was made specifically of the use of a considerable quantity of $AlCl_3$ in the production of anthraquinone for fast vat dyes. It was also suggested that there was a possibility of using chlorination instead of sulphonation in breaking down organic compounds to form dye intermediates.

Possibly most general interest was shown in the increasing popular use of sodium hypochlorite. There has been a widespread demand for bottled technical solutions for general household disinfection, for laundry bleaching and removal of stains, and in food factories and dairies for cleansing and disinfecting utensils.

Mention was also made of the use of chlorine discharged directly in small quantities into the chimneys of plants such as garbage incinerators and sulphate pulp mills seeking to abate industrial stenches.

Status of Organic Electrochemistry

Dr. C. J. Thatcher, chemical engineer, of New York, was chairman of the round-table discussion on organic electrochemistry. It had already been announced that this important subject is to form the theme of a special discussion at the Philadelphia meeting of the society. It seemed advisable, therefore, to review the present status of the art and find out what organic compounds are now being made commercially by electrochemical methods. Prof. Alexander Lowy of Pittsburgh reported on the results of inquiries he had made of the federal departments and of the various synthetic organic chemical manufacturers. Apparently a limited number of the latter are now conducting research along this line, but there are only a very few commercial developments. Paraphenylenediamine was cited as a product that has been made on a considerable scale by purely electrochemical methods. The electrolytic production of benzidine from nitrobenzol is said to be fast approaching the stage of commercial manufacture.

How Silica Protection Tubes Cause
Contamination of Thermocouples

When Such Devices Are Used in a Reducing Atmosphere at High Temperatures, There Is a Marked Reduction in the emf. of the Thermocouple—This Is Lasting for Base Metal Couples and Temporary for Noble Metal Couples

By O. A. Hougen* and B. L. Miller†

IT IS well known that the thermo-electric power of thermocouples is affected by contact with silica protection tubes at high temperatures, especially in a reducing atmosphere. The magnitude of this effect has seemingly not been recorded. It was the purpose of our investigation to determine this effect.

The following procedure was arbitrarily adopted. The couples to be investigated were inclosed in silica protection tubes and calibrated before and after various heat-treatments. Two types of couples were tested—one noble metal couple, platinum-platinum 10 per cent rhodium, and one base metal couple, chromel-alumel.

The platinum couple was subjected to the following heat-treatments:

Preliminary annealing — oxidizing atmosphere
50 hours at 900° C. in a reducing atmosphere
50 " " 1,000° C. " " " "
50 " " 1,200° C. " " " "
Annealing at white heat—oxidizing atmosphere
50 hours at 1,000° C. — " "

The chromel-alumel couple was subjected to the same heat-treatments, except for preliminary annealing and the 50-hour heating at 1,200 deg. C.

The reducing atmosphere was obtained by loosely surrounding the silica tubes with graphite powder; the oxidizing atmosphere by the natural circulation of air through the heated tube furnace.

The apparatus for this investigation consisted of a Pt-Pt 10 per cent Rh thermocouple, a chromel-alumel thermocouple, a Type K-L & N potentiometer, storage cell, standard cell, wall galvanometer, tube furnace, resistor force, reactance coil, ammeter, L & N portable potentiometer, graphite, graphite crucibles, pure zinc, pure copper, pure antimony, and silica protection tubes.

New couples were used for these tests, the platinum couple being carefully annealed before initial use. It was understood that the base thermo-elements had been annealed before leaving the factory. The usual precise method of standardization was used in calibrating the thermocouples. The platinum couple was calibrated against the melting points of zinc and copper; the base metal couple against the melting points of zinc and antimony. The metals used were highest purity Bureau of Standards products. The assembly of apparatus for calibration against fixed points is shown in Fig. 1.

After the first calibration the couples were heated for 50 hours at a temperature of 900 deg. C. in a reducing atmosphere. The apparatus and method of heat-treatment is shown in Fig. 2.

Another heat run of 50 hours at a temperature of 1,000 deg. C. was made for both couples, and one at 1,200 deg. C. for the platinum couple only. Recalibrations were made at the end of each heat run.

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†Chemical Engineering Department, University of Wisconsin.

The couples were then annealed and recalibrated. The couples were annealed by passing a current through the thermo-elements for 15 minutes with the platinum couple at an intense white heat and the base metal couple at a bright red heat. A run of 50 hours at 1,000 deg. C. was made on both couples in an oxidizing atmosphere and then they were recalibrated once more. Recalibration of the noble metal couple was made against fixed points. Recalibration of the base metal couple was made by comparison with a standard noble metal couple.

The calibration curves were computed from the two point equation in each case, $E = at^b$. This equation does not hold exactly over the lower temperature range, but it is useful for comparison of results. The results are given in the accompanying graphs (Figs. 3 and 4) and also in the accompanying tabulation.

What the Tests Showed

First 50-Hour Run (900 deg. C.), Reducing Atmosphere—There was no change in the emf. of either couple.

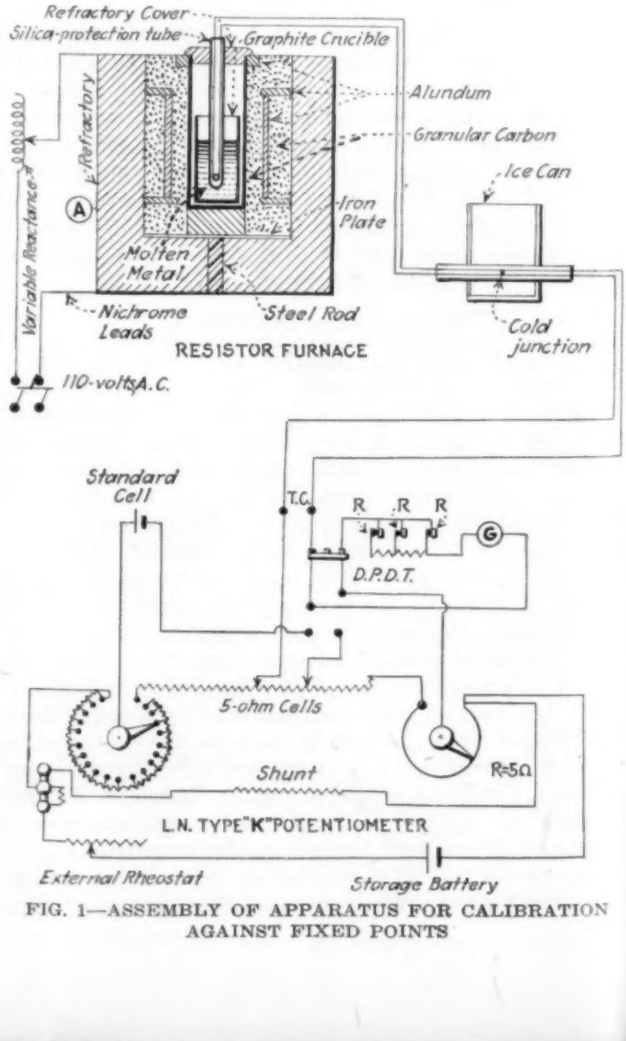


FIG. 1—ASSEMBLY OF APPARATUS FOR CALIBRATION AGAINST FIXED POINTS

RESULTS WITH PLATINUM THERMOCOUPLE

Calibration	Treatment	Zinc Point, Millivolts	Copper Point, Millivolts	Equation
Original	Annealed	3.36	10.458	$E = 0.0024365t^{1.1971}$
Second	50 hours at 900 deg. C. reducing atmosphere	3.36	10.46	$E = 0.0024365t^{1.1971}$
Third	50 hours at 1,000 deg. C. reducing atmosphere	3.33	10.40	$E = 0.002374t^{1.20*}$
Fourth	50 hours at 1,200 deg. C. reducing atmosphere	3.23	10.21	$E = 0.002128t^{1.213}$
Fifth	Annealed oxidizing atmosphere	3.30	10.36	$E = 0.00227t^{1.206}$
Sixth	50 hours at 1,000 deg. C. oxidizing atmosphere	3.30	10.36	$E = 0.00227t^{1.206}$

RESULTS WITH CHROMEL-ALUMEL COUPLE

Calibration	Treatment	Zinc Point, Millivolts	Antimony Point, Millivolts	Equation
Original	.....	16.816	25.564	$E = 0.033366t^{1.03}$
Second	50 hours at 900 deg. C. reducing atmosphere	16.816	25.564	$E = 0.033366t^{1.03}$
Third	50 hours at 1,000 deg. C. reducing atmosphere	16.27	24.479	$E = 0.03121t^{1.036}$
Fourth	Annealing oxidizing atmosphere	17.60	26.06	$E = 0.05121t^{0.966}$
Fifth	50 hours at 1,000 deg. C. oxidizing atmosphere	18.01	26.47	$E = 0.05898t^{0.9474}$

The silica tubes showed no tendency toward crumbling.

Second 50-Hour Run (1,000 deg. C.), Reducing Atmosphere—Both couples showed a reduction in emf. as a result of this run. The thermo-electric power of the noble metal couple was reduced about ¾ per cent, of the base metal couple about 4 per cent. The protection tubes became brittle and even powdered when the surface layer was removed from the tubes.

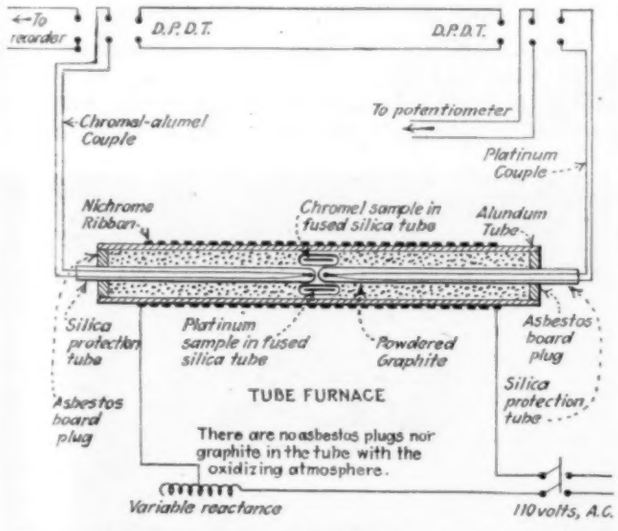


FIG. 2—ASSEMBLY FOR HEAT RUNS IN REDUCING AND OXIDIZING ATMOSPHERES

Third 50-Hour Run (1,200 deg. C.), Reducing Atmosphere—The emf. of the platinum couple showed a marked reduction. The silica tube could be easily crushed and powdered by the hand. The thermo-electric power of the noble metal couple was reduced about 3 per cent from original value.

Annealing, Oxidizing Atmosphere—The platinum couple recovered its emf. to a marked degree. The base metal coupled showed a decided increase in emf. its original value. This indicates that the siliconizing of platinum can be almost completely removed, whereas a permanent alteration takes place in the base metal couple.

Oxidizing Treatment (1,000 deg. C.)—The platinum couple showed no further alteration in emf. The base metal couple showed an increase in emf.

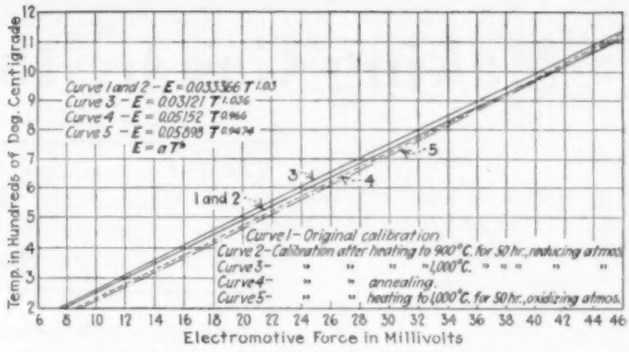


FIG. 3—CURVES SHOWING RESULTS OF TESTS ON BASE METAL COUPLE

again indicating that some permanent alteration had taken place, due to siliconizing. However, visual examination showed that both couples had become brittle in a reducing atmosphere above 900 deg. C., due to contamination by silicon from the reduced silica tubing. Evidence of this is further substantiated by the fact that the silica tubes were brittle and crumbling, and that similar results were not obtained in the oxidizing atmosphere.

At temperatures above 900 deg. C., it seems that it is impracticable to use silica protection tubes for precision work in a reducing atmosphere, as the couples become siliconized. The couples show a marked decrease in potential from the original calibrations.

In an oxidizing atmosphere, the emf. of the platinum couple remains unchanged, while that of the base metal couple shows a decided increase when used above 900 deg. C. for any length of time. This indicates that the siliconizing of platinum can be almost completely removed and the thermo-electric power of the couple restored to almost its original value. It also indicates that the siliconizing of chromel-alumel couples produce some permanent alteration in composition which cannot be remedied by subsequent annealing.

It should be made clear that in each case the couples were inserted in new silica tubes, and did not come into direct contact with the surrounding air except when annealed. It seems that, at high temperatures above 900 deg. C., the silica tube becomes porous and permits penetration of the reduced silicon vapor.

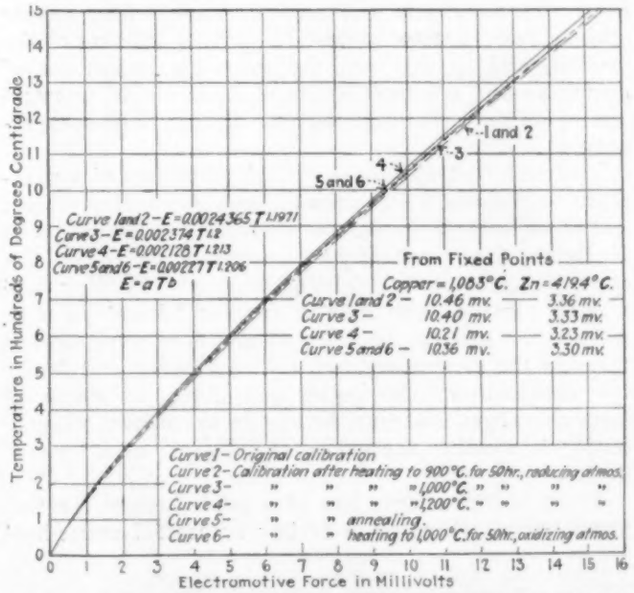


FIG. 4—CURVES SHOWING RESULTS OF TESTS ON NOBLE METAL COUPLE

Making Gas by the Backrun Process

New and Interesting Method of City Gas Manufacture Completely Described by the Inventors —Experiences From Over Two Years Continuous Operation Summarized to Show Advantages.

By George E. Whitwell* and Daniel J. Young†

THE Young-Whitwell backrun gas process is a development in the art of manufacturing illuminating gas which was brought about largely through the desirability of using cheaper fuels for this purpose and at the same time utilizing to a large extent equipment already in existence. Although a product of the Pacific Northwest, where this process is now in operation in four plants—namely, those at Everett, Tacoma and Wenatchee, Wash., and Eugene, Ore., numerous other installations are under construction or operation in Middle Western cities. Of these installations, the first has been an operating success and the only source of illuminating gas in the plant for 2 years; the others have been in successful operation for periods of time ranging from 6 to 18 months. In size, the machines range from 4 to 11 ft., outside diameter.

Briefly, the backrun process, through slight changes in the construction of any ordinary water-gas set, renders available, as generator fuel, either coke or bituminous coal. At the same time it is possible to use, as enricher, low-grade, heavy, high-sulphur oils. Finally, the water-gas set has been simplified to the extent of the elimination of the "hot" or "revising" valve and means provided within the set for the superheating of certain parts of the "make" steam.

Remarkable results have been obtained when slack bituminous coal and heavy oils have been employed. In general it may be said that the operating economies provide for the substitution, pound for pound, of slack bituminous coal for coke and a substantial reduction in the oil required to give any desired calorific value.

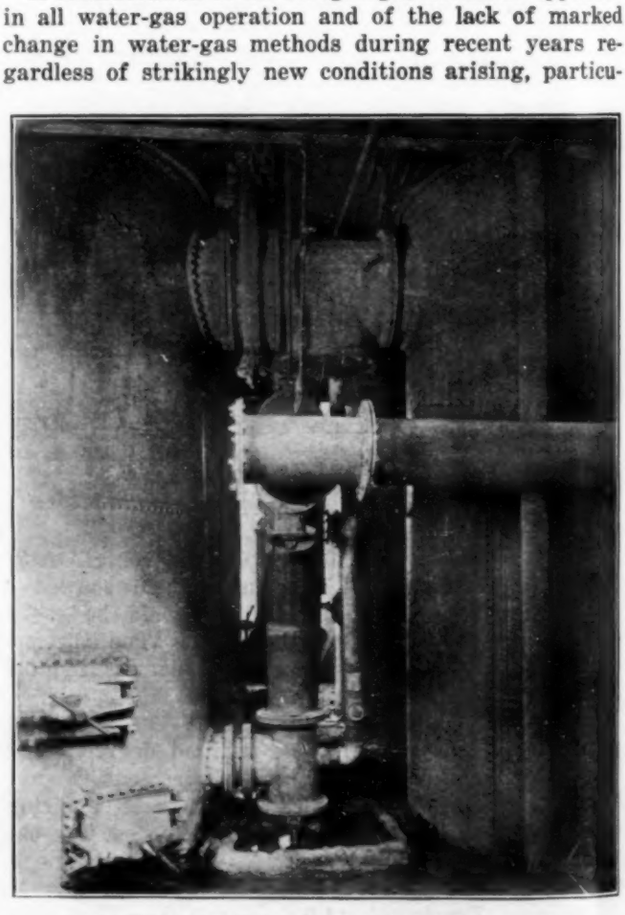
However, it is not the purpose of this first article to detail operating data and results. Also it does appear desirable at this time to describe certain features of the process, and to this end the following exposition of principles and practices as based upon actual commercial operation over long periods of time has been arranged.

A carburetted water-gas set today consists of a generator, carburetor, superheater and connecting valves and pipes, exactly, except for perfection of design, as it did when first successfully introduced. Likewise the cycle, in general, consists of alternate blasting and making periods, with regular runs or "down" runs as needed, the general direction of gas flow being always through the generator, then the carburetor and finally the superheater; the outlet gas going to waste or through various cleaning devices to the holder, depending upon whether the period is a "blast" or a "make" period.

There is still a large loss of sensible heat in the exit gases except where more or less successful waste-heat boilers have been introduced; there is still the necessity for frequent rechecking in carburetor and superheater with the related necessity of using fairly high-grade gas oil; there is still ever present a troublesome hot-valve; the steam coming in contact with the incandescent carbon is not generally superheated, thereby entailing heat loss and requiring a greater ratio of blasting time to making time; it is still essential for most efficient operation that the fuel be high-grade coke or anthracitte coal of such size as to give a fire-bed having special characteristics, operation with the cheaper, fine bituminous coal having been generally unsuccessful; and finally, alternative methods of gas making have entailed heavy capital expenses, regardless of whether those methods have been by means of benches, ovens or such more recent devices as are typified by vertical retorts.

How the Backrun Process Works

A consideration of the foregoing deficiencies apparent in all water-gas operation and of the lack of marked change in water-gas methods during recent years regardless of strikingly new conditions arising, particu-



BACKRUN CONNECTIONS AT GENERATOR BASE OF 7-FT. SET AT TACOMA, WASH.

*Consulting Chemical Engineer, Seattle, Wash.
†Vice-President and General Manager, Tacoma Gas & Fuel Co., Tacoma, Wash., and Puget Sound Gas Co., Everett, Wash.

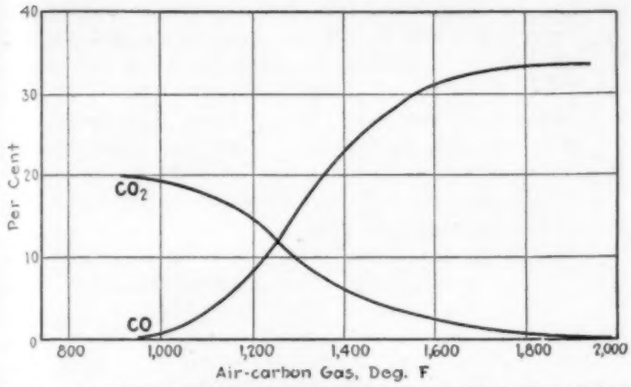


FIG. 1—COMPOSITION OF GAS MIXTURES IN EQUILIBRIA AT DIFFERENT TEMPERATURES IN PRODUCER-GAS REACTION (BLAST PERIOD)

larly as to generator fuel and enriching oil, in thermal value standards, and in the raising of capital for public utility enterprises in competition with tax-free bonds, led to the development of the new process. Fundamentally it is a complete gasification process.

Its improvements over the old methods and equipment and its marked operating savings depend upon utilization of cheap fuel, lessening of heat loss, reduction in maintenance and depreciation, decrease in gas oil used to give a required thermal value, elimination of the expensive and complicated hot-valve, and small capital outlay in installation. Its operating success depends upon the observance of sound, theoretical considerations —namely, strict adherence to correct interpretation of the air-carbon and steam-carbon equilibria as set forth in Figs. 1 and 2; rational and positive heat interchange wherein superheated steam is the medium, with the waste heat, otherwise lost, efficiently controlled; and finally, a new conception of coal distillation in connection with and as a part of water-gas operation.

The process is applicable to any existing water-gas set. The changes needed are as follows:

1. A steam line of sufficient capacity is connected in the top of the superheater above the uppermost tier of bricks, thereby permitting steam to flow down through the superheater, up through the carburetor and into the top of the generator. The cap on the superheater stack may be weighted to withstand the additional pressure.

2. An offtake of sufficient size is provided at the bottom of the generator, whereby gas made during the passage of the steam down through the generator may be led to the seal pot.

3. The hot-valve may be removed.

4. Gate valves, which may be interlocking, or other devices are provided in both the regular and auxiliary gas offtakes in order to control the gas flow.

5. Any self-sealing, continuous coal-feeding device which provides for even distribution over the surface of the fuel bed of finely divided coal is connected to the top of the generator.

The first four changes may be made independently of the fifth. In such event the generator fuel need not change from that previously employed and a considerable saving in manufacturing cost will result, although maximum efficiency is obtainable only with all five equipment changes, accompanied by the substitution for the former fuel of finely divided bituminous coal.

In Everett, the fuel used has varied somewhat, but for the greater part of the time the following procedure has been standard. Upon starting up the machine in the morning sufficient coke has been introduced into the generator to insure a good fuel bed. From this time on, coal has been admitted as needed through the mechanical feed.

Fuel Used in Everett Plant

Were it not for the fact that gas consumption in Everett demands not more than an average of 10 hours' operation per day, the use of coke would not be required. As it is, there is a heavy stand-by loss and it has been found that the use of coke is the most economical method of replenishing the fire-bed which has been consumed during the night. It must not be inferred from the foregoing that a fire-bed can be built up only with coke; coal has always proved successful when tried. As an economical proposition, however, the use of coke is believed to be advisable under the conditions prevailing in Everett.

The coal used has been largely South Prairie buckwheat gas coal (coking) conforming to the following analysis:

Air Drying Loss	Moisture	Volatile Combustible Matter	Fixed Carbon	Ash	Sulphur	Calorific Value
10%	2%	35%	43%	12%	1%	11,250 B.t.u.

In size, all of the coal is a washed Deister table product passing through a ⅞-in. screen.

While South Prairie coal has been used to the greatest extent, various other better fuels have been tried and several other inferior sub-bituminous coals have been mixed at different times in varying proportions with the coking coals. As illustrations of Washington sub-bituminous coals, the following analyses are given:

	Air Drying Loss	Moisture	Volatile Combustible Matter	Fixed Carbon	Ash	Sulphur	Calorific Value
Issaquah....	3%	10%	40%	31%	16%	1%	9,000 B.t.u.
Chehalis....	5%	15%	42%	29%	9%	....	9,000 B.t.u.

Such coals as these may represent up to one-quarter of the fuel charged; if more than this proportion is used, their non-coking properties have an adverse effect

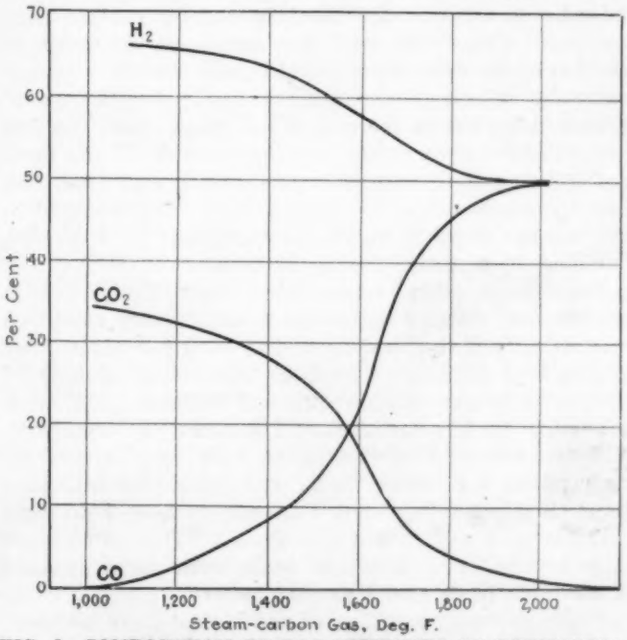
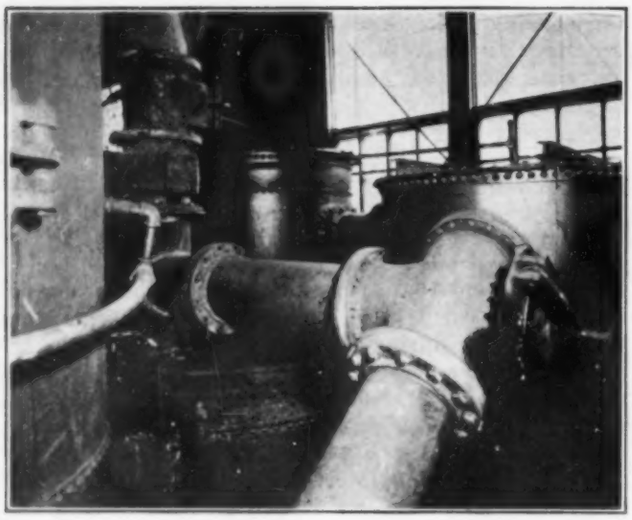


FIG. 2—COMPOSITION OF GAS MIXTURES IN EQUILIBRIA AT DIFFERENT TEMPERATURES IN WATER-GAS REACTION (MAKE PERIOD)



BACKRUN CONNECTIONS INTO WASH-BOX ON 7-FT. 6-IN. SET AT EVERETT, WASH.

upon the physical characteristics of the fire-bed. Similarly coke breeze may be used up to one-fourth of the total fuel charged.

The subject of fuel may be summed up briefly. That fuel is used which, under existing operating conditions, will give the greatest number of gaseous B.t.u. for the least net cost.

The Backrun Process Cycle

Given a generator full of fuel, the blast is concluded in the regular manner, at the temperature desired in the generator and carburetor. With the valve in the regular offtake closed, the one in the auxiliary offtake is opened as soon as the blast air is cut off. The stack valve is closed; steam is turned into the top of the superheater and allowed to pass until a desired generator temperature is reached, or in routine operation for a predetermined length of time. The valves in the gas offtakes are then reversed and a regular "up" water-gas run with or without admission of oil to the carburetor proceeds for such time as has been predetermined. After this the blast is put on in the usual manner. Coincident with the admission of steam to the top of the superheater, coal is admitted to the generator by means of the self-sealing feeding device at such a rate that at the end of the "back" run, the fuel bed will have been completely replenished. If the process is being used without an automatic coal feed, this feature of the cycle is omitted, fuel being charged in the manner usual to water-gas operation; or if desired, fuel may be admitted during an uprun.

Several cycles have been used successfully, but in general, the fire-bed maintains a satisfactory condition most readily if the blasting and making periods are not of too long duration. Probably the most valuable of the cycles is one which requires 2 minutes blast, with secondary air in a curburetor; 2 minutes "up"-run, with oil introduction; 2 minutes blast, with secondary air in carburetor; 2 minutes "back"-run, with coal introduction; 1 minute "up"-run. In conjunction with this cycle, brief air purges are desirable. This same cycle may be run on a 3-minute basis with some success. A 4-minute basis is not as satisfactory.

Similarly, with certain coals and when more oil must be used, the cycle may be varied so that there is but one "back"-run for each two "up"-runs. Or, if desired, oil may be introduced into the carburetor during the "up"-run following the "back"-run. This last method is not always advisable, however, because the cooled condition of the top of the generator may result in high CO_2 content in the gas. Under these conditions, the oil efficiency will be lowered. For this same reason, it is often advisable to make the "up"-run following the "back"-run of only sufficient duration to clear the bottom of the generator of gas.

When using the "blow"-run, the following cycle was found to be satisfactory: blast, 2 minutes; "blow"-run, 30 seconds; "up"-run, 2 minutes; purge, 6 seconds; blast 2 minutes; "blow"-run, 30 seconds; "back"-run, 2 minutes; "up"-run, 18 seconds; purge, 6 seconds. On this basis, it was possible to make six complete cycles per hour. The making time each hour was 33 minutes; the blasting time 24 minutes; 3 minutes remaining for valve manipulation.

It was found that the same benefits resulted from the use of the "blow"-run that had been noted by the gas engineers of the Bureau of Mines. Similarly, although capacity was increased by its use, more oil was required in maintaining a given calorific standard.

Maintenance of Fuel-Bed Condition

Previous experience in the substitution of bituminous coal for coke or anthracite coal as generator fuel in water-gas sets has not been generally satisfactory. Four principal reasons have been offered for this; first, the nature of the fire-bed has been unsuited to the ready passage of steam and air accompanied by maximum chemical reaction; second, because of the nature of the fire the carburetor has become overheated, resulting in incomplete combustion of the blast gases, inefficient use of oil and rapid deterioration of checkerbricks; third, decreased capacity; fourth, general dirtying and clogging of the entire set with coal dust and particles. A consideration of the new equipment and cycle of operations described will disclose the methods used to overcome these four disadvantages:

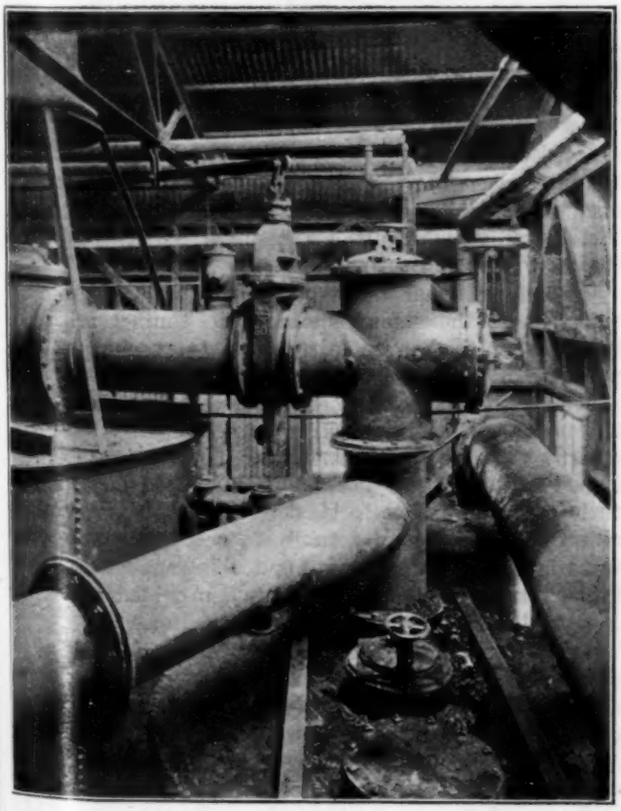
1. The fuel is charged intermittently, but during the time of charging it is gradual and continuous and in no way stops or retards gas making, thereby permitting smaller charges during any one period and eliminating the necessity for the dumping in at one time of large quantities of cold coal, a condition that invariably results in heat loss and an unfavorable condition in the fuel bed. Moreover, during the charging, the coal must pass through a zone of highly superheated steam. Sprayed in, each particle of the finely divided coal comes in contact with its quota of heat carried by the steam or radiated from the generator walls. It is in this connection that the fundamental idea of distillation, previously mentioned, has been developed. The first-named disadvantage of the use of bituminous coal in water-gas sets has thus been largely eliminated and a fuel bed under backrun operation at all times closely approximates that which would be found in any water-gas set where coke or anthracite coal is used as generator fuel. Trouble with "holes" in the fire has been reduced to a minimum. It is a very simple matter to control their formation after a little experience with any given fuel. Observation of the stack flame gives a very sure indication of their presence. It is desirable to bar down immediately if their presence is suspected. In Everett, this has been necessary about every 2 hours.

2. It is readily understood why a carburetor under conditions of use with bituminous coal should become

overheated during the blast and produce the undesirable results previously stated. With coke operation, the maximum heat is produced very close to the mass of coke, there being little or no volatile matter to enter into combustion at a distance from the surface of the fuel bed. With coal, however, the volatiles do burn at a distance from the fuel bed and hence give up to the carburetor more heat on primary combustion than is required.

With either fuel, the net result with primary air at the temperature of the generator would be to produce an excess of carbon monoxide. In operation with coke, the combustion is rendered complete in the carburetor and superheater by means of secondary air and is a desirable operating feature, inasmuch as the heat thereby given off is stored for later use in cracking the gas oil. Where coal has been used in the past, however, such secondary combustion has been largely precluded by the overheated condition of the carburetor as a result of primary combustion. If secondary air is added, the too hot checkerbrick causes low oil efficiency and rapid deterioration of the brick; if secondary air is omitted, there is large waste in the exit blast gases.

With the backrun process, however, the upper zone of the fuel bed is the coolest, thereby permitting of greater amounts of carbon dioxide upon primary combustion (see Fig. 1) and at the same time permitting of maximum carbon monoxide during the make period, inasmuch as, during the first part thereof, the gas leaves from the bottom or hottest zone of the fire-bed. Furthermore, provision is made for considerable distillation during the charging of the coal, so that fewer valuable volatiles remain in the fire-bed to be consumed during the blast. Finally, in this process it is highly desirable to have the carburetor overheated during the blast, inasmuch as such excess heat is returned to the generator with the superheated steam, leaving the carburetor at the proper temperature for the subsequent efficient cracking of the gas oil. It is therefore possible to use secondary air and permit of as complete combustion as may be possible in the exit blast gases.



CONNECTIONS TO WASH BOX AND VALVE OF 9-FT. BACKRUN GAS SET AT TACOMA, WASH.

3. It appears from results to date that on substitution of bituminous coal for coke as generator fuel, the make per unit of time increases about 10 per cent; on substitution for anthracite as generator fuel, the capacity decreases about 10 per cent. The decreased capacity has probably been caused by the unfavorable nature of fuel bed, the decrease in the ratio of making time to blasting time, the excessive wasting of valuable volatiles in the blast gases, incomplete combustion during the blast, rapid deterioration and clogging of the checkerbrick, lessened oil efficiency and the decreased fixed carbon and ultimate carbon by nature in bituminous coal when compared with an analysis of the coke resulting from that same coal.

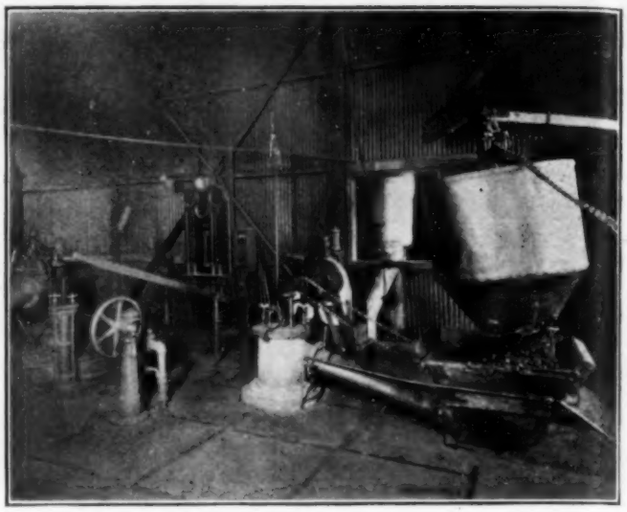
Of these causes, the backrun process eliminates the unfavorable nature of the fuel bed by reason of the method of coal introduction; tends to increase rather than decrease the ratio of making time to blasting time because of the superheated condition of the steam; reduces the waste of valuable volatiles in the blast gases because of the time and conditions of coal charging; gives complete combustion of the exit blast gases; and increases the life of the checkerbrick while materially reducing clogging, as pointed out below.

The process also decreases the oil consumption per thousand required for any given thermal value, substituting, for the oil gas, that gas which results from coal distillation. Hence, inasmuch as the rate of oil introduction may be maintained as under operation with coke and the time thereby gained devoted to increase the time of reaction between superheated steam and incandescent coke, there will generally be no decreased capacity due to lessened oil consumption. The decreased tonnage of fixed or ultimate carbon in a given weight of bituminous coal, as compared with coke, appears to be the factor to which the slight over-all decrease in capacity must be attributed when the backrun process with bituminous coal supersedes the regular process with anthracite.

A brief consideration of the backrun process cycle will serve to show the reason for the remarkable performance of that process in preventing the deterioration of the checkerbrick and general clogging of the machine with coal dust and particles of lamp black. The steam coming back from the top of the superheater effectively removes all traces of carbon from both superheater and carburetor bricks. This action is probably both mechanical and chemical. That there is an actual combination of steam with the carbon to give hydrogen and either carbon monoxide or carbon dioxide, or both, depending upon the temperature (see Fig. 2), has been demonstrated by chemical analysis of the gas in the top of the carburetor during the period of the cycle. In any event, after using the backrun process, the bricks are clean and sound.

Moreover, by actual operation, it has been determined that, if a dirty machine ready for recheckering after regular water-gas operation be provided with backrun equipment, inclusive or exclusive of the self-sealing coal feed, and be then operated with any fuel, the carbon existing throughout the set will be removed and, provided the brick have not actually crumbled, their life will be prolonged materially.

One of the outstanding experiences gained in Tacoma was with the use of heavy, low-grade oil as enricher. While it is probably of no great benefit at the present time to use such low-grade oil, inasmuch as the better oils have cheapened to a marked degree, it is nevertheless valuable to know that oil heavier than 14 deg. Bé. can be used, not only without clogging of the carburetor checkerbrick, but also with longer life for the brick than was obtained when using 24-deg. Bé. oil with straight water-gas operation. Such was the actual experience at Tacoma when tried with 14 deg. Bé. oil on a 6-ft. set during December, 1921, and January, 1922. The checkerbrick in this machine, including the time of use of 12 to 14 deg. Bé. oil (during the remainder of the time 24 deg. Bé. oil was employed), lasted more than 4,000 hours. This is in striking contrast with a common maximum life of 800 to 1,000 hours before recheckering.



COAL-FEED FOR 7 FT. 6 IN. BACKRUN GAS SET AT EVERETT, WASH.

Decreased Heat Loss in the Process

The decrease in the heat loss in the process results from a combination of several factors—namely, (1) a reduction in the sensible heat of the outgoing gases, (2) the superheating of the steam by the set itself, (3) practically complete combustion of the fuel during the blast period, (4) the contact of superheated steam with incandescent carbon, (5) decrease in radiation, and other minor losses. Briefly, this may all be included in the statement that the ratio of making time to blasting time is increased.

1. The steam entering the top of the superheater at or near 212 deg. F. reduces the temperature of that portion of the set; consequently the outgoing gases are subsequently lowered in temperature to a corresponding degree and the sensible heat loss reduced. Actual operation shows the temperature of the gases outgoing from the superheater to approach 1,200 deg. F. instead of 1,300 or 1,400 deg. F., as is common with regular water-gas operation. The heat saved is transferred by the steam to those portions of the set where it can do useful work. The lowered temperature in the superheater has had no apparent effect upon the completeness of "fixing" of the gas.

A still more marked saving in sensible heat is noticeable in the offtake at the bottom of the generator. The gas at this point has never been known to be higher than 800 deg. F. The heat saved here applies to a considerable percentage of the make gas and is undoubtedly stored in the lining at the bottom of the generator to be given up to the air and steam subsequently incoming at this point, thereby doing useful pre-heating work. It should be noted that this saving of sensible heat is applicable regardless of the generator fuel used.

2. To a large extent the blast steam serves as a medium for the transfer of heat. Picking up heat as it travels from the top of the superheater, it arrives highly superheated at the top of the generator, there to give up its heat to aid in the useful gas reaction. The heat transfers are decidedly marked and offer a very pretty phenomenon to be indicated or recorded by pyrometers. Such an instrument in the carburetor, for instance, will increase from 1,300 to 1,600 deg. F. while blasting, only to be reduced to 1,400 deg. F. as the steam becomes superheated and finally to 1,300 deg. F. after all oil has been introduced. The action is decided, positive, and never fails to take place.

The most important question to be determined in this transfer of heat is the extent to which the quantity of steam per 1,000 cu.ft. of gas should increase. It is a matter of simple calculation to show that it would require more steam than would be feasible were it expected that all of the heat supplied to the incoming cold coal should come from the superheat of the steam. Were this to be attempted, the excess steam passing through the fuel bed would undoubtedly result in an unfavorable reaction whereby excessive carbon dioxide would be formed. It is possible, however, to determine for each installation the proper amount of steam per 1,000 cu.ft. of gas so that the maximum over-all efficiency be obtained; and this feature of the process is applicable regardless of the nature of the fuel and the manner of its introduction.

3. In obtaining high carbon dioxide values upon analysis of the exit blast gases there is little to be gained over previous water-gas practice, inasmuch as this condition exists in well-controlled carburetted water-gas manufacture from coke. It is, however, a decided step forward to have such a situation where bituminous coal is the generator fuel. The reason for such complete combustion has already been given and the degree to which it has resulted has been demonstrated by chemical analysis.

4. Under normal water-gas operation, it is deemed sufficient if the steam coming into contact with the incandescent carbon be fairly dry. In reaching a temperature equilibrium with the fire-bed, heat must be absorbed therefrom. When the steam is superheated, however, as in the backrun process, it is at once apparent that the make period can continue for a longer time than when it is not. This serves to increase the ratio of making time to blasting time. This favorable result has been found actually to occur in all installations and the advantage is applicable regardless of the fuel or method of its introduction, provided the steam is admitted at the top of the superheater.

5. The heat losses from water-gas sets still to be discussed are the minor ones, resulting from radiation and the like. Inasmuch as the main body of the water-gas set remains unchanged, what reduction in radiation is obtained results from lessened temperature in the top of the superheater, lack of necessity for opening the top of the generator when charging fuel, and decreased ash and clinker per ton of fuel charged, the

last-named condition having been very marked at Everett. There is a further minor saving due to the removal of the hot valve, for without it there is no heat conducted away in cooling water.

It is believed that the decreased clinker trouble under backrun operation will result in marked lessening of depreciation of the generator lining. Two factors tend to reduce the clinker: First, the smaller percentage of ash in the generator fuel when bituminous coal is used; and second, the even distribution of the fuel charged. The first of these causes is self-evident; the second has already been noticed in the Morgan producer, where the George continuous feed with its even fuel bed and lack of necessity for frequent barring down has demonstrated the value of such a feed in reducing clinker troubles. Of course, with improper operation of the backrun process, it is possible to get bad clinkers; but the conditions under which this undesirable result occurs have been thoroughly investigated and can be easily avoided. The immediate result of decreased clinker troubles is increased capacity and reduced radiation loss from ash and clinker; the more remote saving is in increased life of generator lining.

What Has Been Learned to Date

The experience for more than 2 years on sets from 4 to 11 ft. outside diameter using the Young-Whitwell process have demonstrated the following facts:

1. The equipment is substantial, will operate quickly and with but little cost for maintenance when handled over long periods by regular operating crews, and is capable of standardization and automatic control for any make of water-gas machine.

2. Apparently the fuel to be used is largely a question of net gas cost; finely divided coking coals of various kinds have been successfully used; mixtures of one part sub-bituminous coal and three parts coking coal have worked well; coke can be utilized to better advantage than when used in straight water-gas operation; and even tar or tar mixed with partly distilled sub-bituminous coal has given reasonably good results.

3. The oil required for any given calorific standard with coal as fuel has been reduced 15 to 20 per cent and is susceptible of further reduction.

4. Several successful operating cycles have been established; the "blow-run" cycle can be used to advantage.

5. It appears that the capacity, when using finely divided coal for generator fuel, is about the same as that which has been obtained by the Bureau of Mines when using lump coal; the capacity with coke as generator fuel shows about 10 per cent increase over the use of coke as fuel in straight water-gas operation.

6. Of coal containing but 75 per cent combustible, as little as 41 lb. per thousand has been required for two consecutive months, including a stand-by loss of 14 hours out of each 24; the amount of combustible required per thousand, on continuous operation, should be less than 30 lb.

7. No more steam is required per thousand than with ordinary methods.

8. Satisfactory fire-beds capable of withstanding desirable amounts and pressures of air and steam can be established and maintained with all fuels tried; the resulting clinker is properly located and can be removed less frequently and with less labor than has been the usual experience with straight water-gas operation.

9. There is no undesirable smoke nuisance.

10. Maintenance cost of checkerbrick and linings is less than half that necessary with straight water-gas; there is no hot valve to be maintained.

11. Labor is more than satisfied with the easy and simple backrun operation.

12. Residual credits are increased rather than decreased.

13. Positive and substantial heat savings have been uniformly obtained.

14. Finally, wherever tried, the use of this process has resulted in marked saving in the holder cost per thousand feet of gas.

Legal Notes

By Wellington Gustin
Of the Chicago Bar

Liability of Sales Agents to Principals

Decision Emphasizes Fact That Agent Must Act in Good Faith and Must Not Speculate in Product or Make Secret Profits

IMPORTANT questions involving sales of factory output are found in a decision of the Supreme Court of Pennsylvania wherein the Allegheny By-Product Coke Co. had brought suit against J. H. Hillman & Sons Co. (118 Atlantic Reports 900.)

The By-Product company, chartered in 1915, secured a plant in operation at Glassport, and entered into two contracts with Hillman & Sons Co., one of which made provision for the supplying of such coal as might be necessary in its business, and the other appointed the defendant its exclusive sales agent, "to use its best efforts to sell the entire output of coke produced at the plant, at the best possible price obtainable, and to exercise its best judgment as to when and for what length of time contracts should be made."

There were various contracts entered into between the parties for the disposal of the product output of plaintiff. In the case of all the contracts with the exception of the first, defendant, in addition to its commission, took advantage of the freight differential of 15 or more cents per ton, and in certain cases received not only the fixed price but, under the terms of its contract, obtained allowances for wage advances, none of which were accounted for.

It appears that in 1919 the plaintiff discovered that its product had been sold for larger sums than had been paid to it by the agent, and thereupon it sued for an accounting of all amounts improperly withheld from it. Defendant contended that in the various transactions the products of plaintiff had been purchased by the defendant, and it was therefore at liberty to make resale at whatever prices it might see fit, accounting only for the sums named in the contracts with the plaintiff.

The trial court found the relation of the parties was that of principal and agent, and the agreements executed, though calling the transactions sales, were merely put in this form to aid in the carrying out of the agency contract between the parties.

At the hearing defendant submitted a statement showing responsibility for $45,011.41, but this was excepted to, and a second account was filed, by which the amount was increased to $78,744.95. This being complained of

as insufficient, testimony was taken and the master came to the conclusion defendant should pay $509,141.48, subsequently increased by the court in banc, by the addition of interest, to $639,020.56, which, with costs, was directed to be paid to the plaintiff. From this decree an appeal was taken.

While the Supreme Court concurred in many of the findings of the trial court, it held the master in error in refusing commissions and compensation for all transactions when dishonesty had been shown only in certain cases. The principle applied by the Supreme Court is as follows: "The fact that an agent is guilty of fraud, misconduct, etc., with reference to one transaction does not defeat his right to compensation in regard to another transaction negotiated for the same principal, although he is regularly employed by the principal and the transactions are like in nature, where by the contract of agency his compensation is computed separately with reference to each transaction." Therefore the decree of the trial court was modified accordingly.

Other important points brought out in this decision are summarized in the following paragraphs.

An agent, through which a plant's output is sold, is bound to account to its principal for freight rebates received by it from a buyer by reason of a change in the point of loading.

An agent, employed to sell the company's output at agreed prices, is liable to its principal for wage advances and larger prices based on increased cost of production received under undisclosed arrangements with buyers.

An agent stands in the capacity of a fiduciary to his principal, whom he must serve in all his dealings with the utmost good faith and loyalty, making known all matters affecting transactions which may be of importance to him.

An agent must not speculate in the subject matter of the agency, conduct a rival business, sell to himself, make secret profits, or ask for compensation from both buyer and seller without disclosing the fact to each.

Though an agent given legal control of property to make a sale thereof can be made to pay over the sum received, if larger than that remitted to his principal, and is responsible for damages in case of negligent conduct, he is not technically a converter, "conversion" implying an unauthorized dominion over another's property.

Delay Causes Loss of Trademark Rights

Efforts to Charge Infringement and Unfair Methods Fail When Competitor Was First to Register Trademark and Develop Territory

In the case of C. B. Fleet Co., Inc., versus Mobile Drug Co., the former brought suit for infringement of its trademark, "Phospho-Soda," by the manufacture and sale by the defendant of a similar preparation under the trade name "Phospho." The former had been using its mark on a preparation since 1894, enlarging its sales thereof throughout the Southern states with other territory. This mark was not registered until 1916, however. The defendant has for a number of years past been making and selling in the Southern states, especially Alabama and Florida, a similar preparation registered in 1902 under the name Phospho.

Plaintiff contended that defendant and its predecessors embarked in business to anticipate the extension of the sales of "Phospho-Soda" in Alabama and neighboring states, and further charged fraudulent purposes in the manufacture of defendant's preparation and in the registration and use of the trademark "Phospho."

The court points out that both "Phospho" and "Soda" are descriptive words, and suggests that, as such, merely descriptive terms are not the subject of valid trademarks, citing Standard Paint Co. vs. Trinidad Asphalt Co., 31 Sup. Ct. 456; and Brown Chemical Co. vs. Meyer, 11 Sup. Ct. 625. But it says if either word is subject to registration as a valid trademark, defendant's mark has been registered since 1902, 14 years before plaintiff's trademark was registered, and defendant and its predecessors have continuously used said trademark since 1902. And it was not contended or shown that defendant was guilty of unfair trade as entitled plaintiff to an injunction. Indeed the defendant had long since occupied territory into which the plaintiff now desired to enter. During all this time plaintiff took no steps to prevent the building up of said business, the outlay made therein, etc., after 9 years of prior use by the defendant, but sat quiet during the continued public conduct of the defendant for 10 years more before this suit was begun. Under such facts the court says the plaintiff was guilty of such laches that equity will withhold relief from those who have delayed the assertion of their claims for an unreasonable length of time.

Therefore the judgment denying relief to plaintiff was affirmed by the U. S. Circuit Court of Appeals.

Explosibility of Ammonium Nitrate

A preliminary study of the properties of ammonium nitrate that influence safety in storage, handling and use has been completed by the Department of the Interior through the Bureau of Mines. This work is conducted in co-operation with the National Research Council, which established a committee for the investigation of the explosibility of ammonium compounds, as the result of a number of explosions of ammonium nitrate in chemical works and other places. The committee is composed of members of the Bureau of Explosives, Army, Navy, Fixed Nitrogen Research Laboratory and Bureau of Mines. Ammonium nitrate is extensively used in making mining and military explosives and in the manufacture of fertilizers. The bureau's experiments have yielded definite data on the effects of heat, pressure and density of packing on the stability and sensitivity of ammonium nitrate. The results of this study have not been published as yet. Further work will be undertaken by the bureau on special phases of this problem.

Canada's Newsprint Exports Increase

Exports of Canadian newsprint as well as of wood pulp show big increases, as reported in a bulletin issued by the Dominion Bureau of Statistics, quoting figures for 12 months past as well as for recent months.

Newsprint paper exported in August amounted to 2,091,352 cwt., compared with 1,540,081 cwt. in August of 1922. All but 24,410 cwt. of the August exports went to the United States. For the 12 months ended with August Canada exported 21,788,771 cwt., valued at $80,713,487, as against 17,325,904 cwt. for the previous 12 months, which had a value of $66,200,094.

Leaching and Extraction

The Article Published Below Is an Advance in the Technology of this Unit Process and as Such Is of Significant Interest to Production Men in the Chemical Engineering Industries

Metallurgical Leaching Methods Offer Suggestions for Chemical Engineers

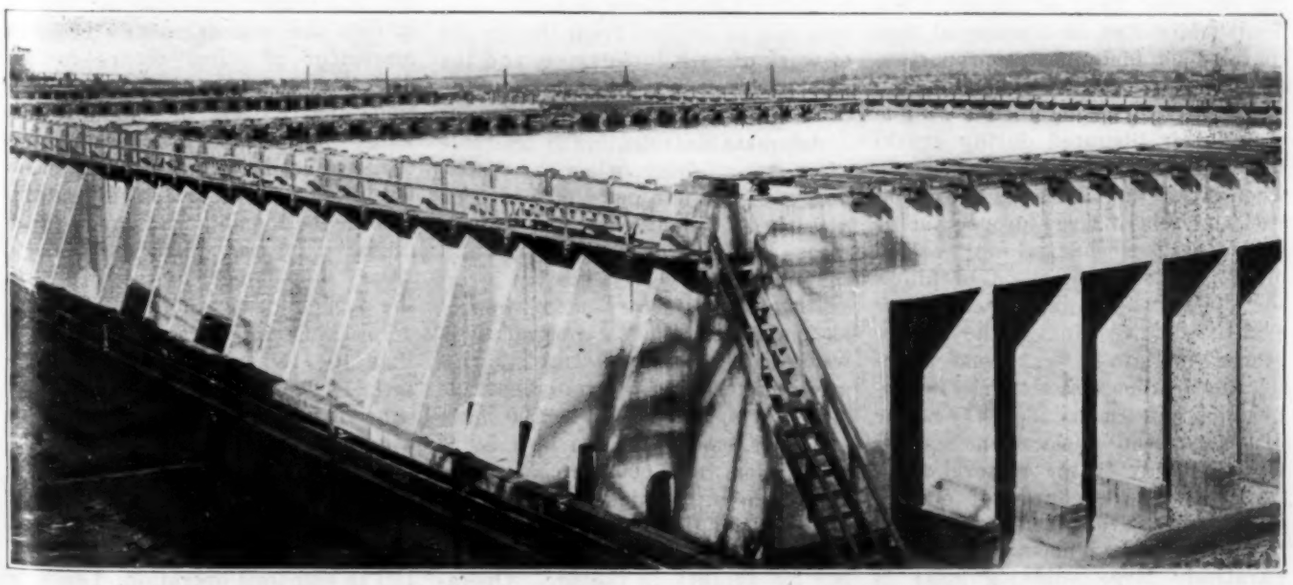
Study of Fundamentals Which Have Made Possible Efficient, Low-Cost Leaching of 10,000-Ton Charges Will Repay Operators Interested in This Unit Process

By A. W. Allen
Assistant Editor, *Chem. & Met.*

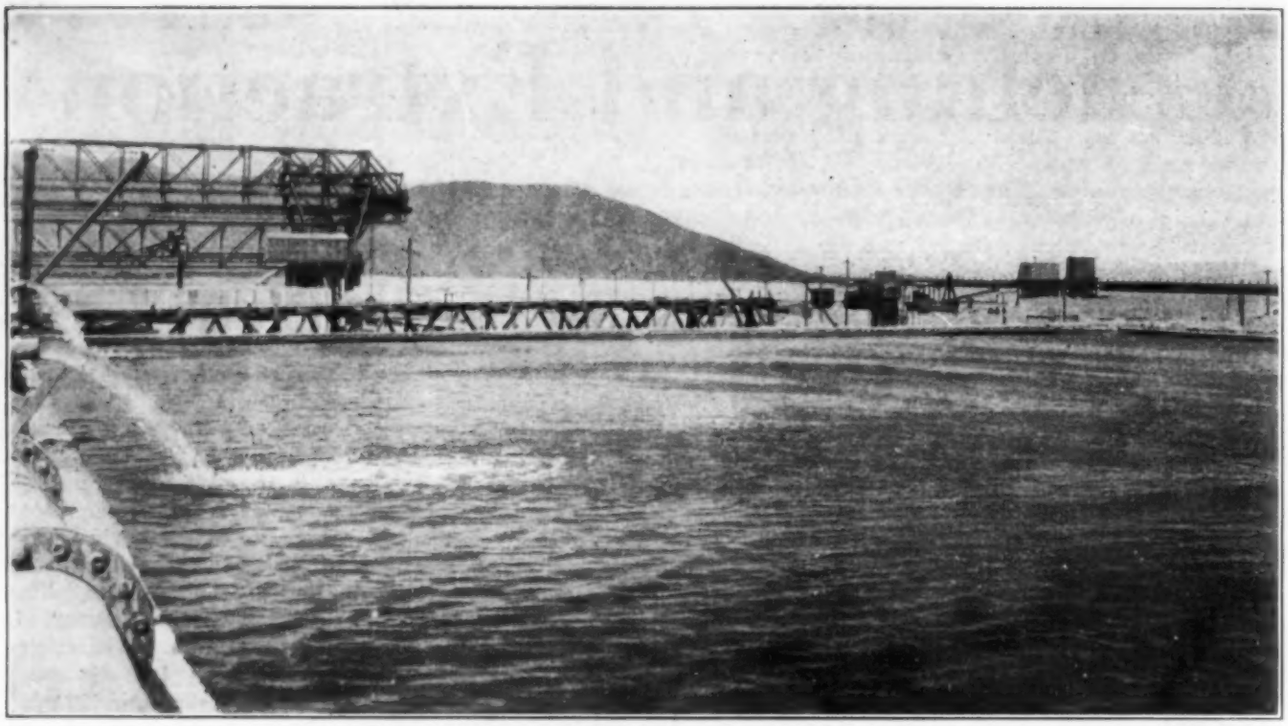
In a previous article (*Chem. & Met.*, vol. 29, p. 471, Sept. 10, 1923, the scope of the term leaching was defined and some of the fundamentals of heap leaching were considered. The present article extends the discussion to the problems of vat leaching, where the material is submerged in the percolating solution.

The efficient extraction of soluble material associated with an insoluble gangue depends primarily on correct physical conditions. Reduction in particle size may not lead to better results; there is an economic limit to the degree of crushing that should be practiced. Comparatively coarse crushing may show a higher extraction than finer crushing, because the even percolation of solution is possible around all the particles, resulting in an even displacement. After finer crushing, on the other hand, the rate of percolation may be hindered to such an extent that downward leaching is impossible. If upward flow is adopted, pressure develops, and the solution breaks through parts of the charge, leading to rapid and abnormal local flow, the disarrangement of the finest material and the fouling of the effluent with suspended matter.

The primary consideration to be observed in crushing for leaching is that comminution should be carried to such a degree that the best economic results are obtained. If it be necessary to crush fine, and assuming that percolation is possible at an economic rate, the extraction is usually satisfactory, because of the even packing of the charge and the regular flow of solution through all parts of the mass. If it be unnecessary, for extraction purposes, to crush fine, care should be taken to see that the composition of the mass and the rate of percolation are such that no appreciable movement of the finest material occurs, when leaching is in progress, in the direction of flow of the solution. If there be insufficient finer material to fill or nearly fill the voids between the coarser lumps, the distribution of the so-called slime through the mass will be disturbed, and this will lead to the short-circuiting of solution. In such event the solvent will follow the line of least resistance, in parts of the charge; elsewhere, coarse material will become occluded with transported fine material, often colloidal in nature. The essential requirement for successful leaching is that there be no disarrangement of the even distribution of fine and coarse particles, relative to one another. The maintenance of the original standard of heterogeneity of particle distribution is essential. So far as I know, the influence of air spaces on the efficiency of displacement has not received the attention it deserves, especially in regard to bulk leaching. I noted recently in a refractory plant in the vicinity of Los Angeles that the physical composition of the mixture, to insure the minimum of in-



5,000-TON LEACHING VAT AT AJO, ARIZONA



ADDING THE LEACH TO A LARGE VAT IN WHICH DOWNWARD PERCOLATION IS BEING PRACTICED. NOTE THE QUIESCENCE OF THE SURFACE

terstitial space, was determined with scientific accuracy. Similar exactness has marked certain stages in the development of the asphaltic pavement and the concrete foundation. Care in elementary matters of physical composition accounts in large measure for the efficiency of result.

In many applications of bulk leaching it has been found practicable to obtain a high extraction of soluble by crushing to ½ in. or even coarser. Several instances are on record in which finer crushing would involve a capital and operating expense out of all proportion to the small increase in extraction obtainable. In some cases the economic limit of crushing has been determined on a material that contains an insignificant proportion of slime or colloid, and in which a comparatively small amount of fine material is liberated during crushing—in which the crushed mass, when evenly distributed in a leaching vat, contains a large proportion of voids. By a mechanical modification of the customary method of filling the vat—by designing the conveyor system so that some of the largest lumps gravitate to the bottom, forming a bed—the extraction may be improved. In such instances the better dissolution and displacement may be due primarily to the removal from the body of the charge of enough large lumps so that the finer material remaining forms a mass with no comparatively large voids, a mass in which retardation to the passage of the solution is equal in all parts. One of the great advantages of gravity leaching by the submergence method is that it makes possible, at small initial and operating cost, the efficient treatment of the finest particles; provided, however, that physical conditions are correct initially, and that such conditions are maintained throughout treatment.

One of the most interesting gravity leaching operations at present—from the chemical, metallurgical and economic standpoints—may be found in the extraction phase of the recovery of copper from oxidized ore, in which unit charges may weigh from 5,000 to 10,000 tons. Many important lessons can be learned from the results of work of such importance, and the principles involved are worthy of the close attention of chemical engineers.

Adequate classification is desirable after wet-crushing, when the distribution of the fine material has been disturbed beyond hope of readjustment; but it is illogical to maintain that preliminary classification is essential to satisfactory percolation in all instances. Such a contention is weakened by the evidence that a mixed material, of individual particle size varying from ½ in. to 200 mesh and finer, can be treated by gravity percolation, in 10,000-ton charges, so that the loss in residue is only about 6 per cent of the comparatively small amount of metal (1.71 per cent copper by weight) in the ore. Operations such as this indicate the scope of gravity leaching, without classification, if carried out under proper conditions; the extraction data and costs presage a still greater use of the method in other, allied industries. Classification prior to leaching in such an instance would mean the economic failure of the venture.

Bulk-leaching, if applicable, is usually a highly efficient operation. There is no evidence to show that the slime tends to occlude the coarse material. If the charge is proportioned satisfactorily (and there is wide latitude in this respect); if the relative distribution of coarse and fine is insured by adequate preliminary mixing and proper distribution; if conditions are maintained so that no movement of slime occurs in the direction of flow of the effluent solution—the recovery of soluble in the finest material, as well as in the coarsest, considering the comparatively low cost of equipment and operation and the ability to handle large unitary charges, will be satisfactory, from the technical as well as from the economic standpoint.

Leaching infers something more than the removal of a soluble material from its native habitat. The submergence of an ore or mineral in a solvent may insure the extraction of a high percentage of the recoverable constituents, but efficient displacement of this solution with other, weaker solution and water is essential to economic operation. Leaching is usually accompanied by percola-

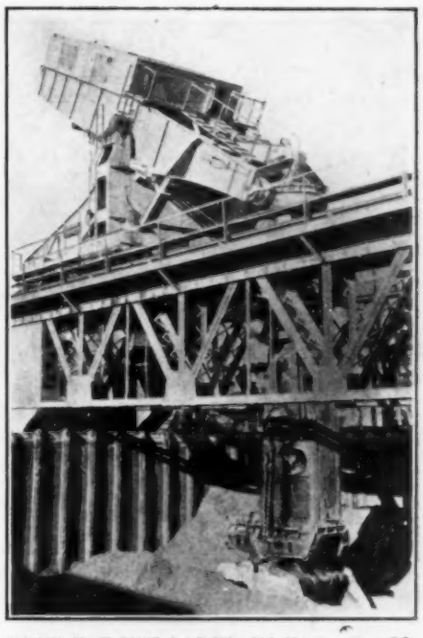
tion, and it is pertinent to point out that the efficient displacement of solution during leaching, so far as I can see, must take place in an upward or in a downward direction. This involves (*a*) pumping from vat to vat in any system of solution concentration, or (*b*) the erection of the vats at different levels. The latter practice would involve obvious disadvantages. In the Skanks system, as practiced on the Chilean pampa for the recovery of nitrate from caliche, an effort is made to secure displacement from vat to vat without recourse to pumping and without having arranged the vats at different levels. The cachuchos, as the vats are termed, are built in unit nests, each in the form of a large steel container with divisional plates. The customary method of circulating the solvent solution varies within narrow limits, but the usual practice is to pass the liquor through an opening in the side of each cachucho, and out through a channel leading from the space underneath the crinolina or bottom support. The result is that operations are considerably simplified, but at the expense of efficient displacement. I have endeavored in sundry published matter to show that it is largely because of the neglect to consider fundamental principles in the physics of leaching that the average recovery in the plants is so low.

There has been a tacit acceptance of the standard that the rate of solution flow, per hour, should be measured by the subsidence of liquor above the surface of the charge, expressed in inches. This makes possible a comparison of results; but no index of permeability of crushed material appears to have been established, measured by rate of downward flow through a certain definite depth of charge, the level of liquor above the charge being maintained within recognized limits. I suggest this is a promising field for experimentation and definition.

In some cases a leaching rate of $\frac{1}{2}$ in. per hour through 4 ft. of material indicates efficient practice; in others, a rate of 40 in. through a depth of 20 ft. is desirable; no generalization is advisable. The term "leach permeability" might be used in regard to material containing a small percentage of soluble to denote, in centimeters per hour, the rate of flow of water at atmospheric temperature through 1 meter.

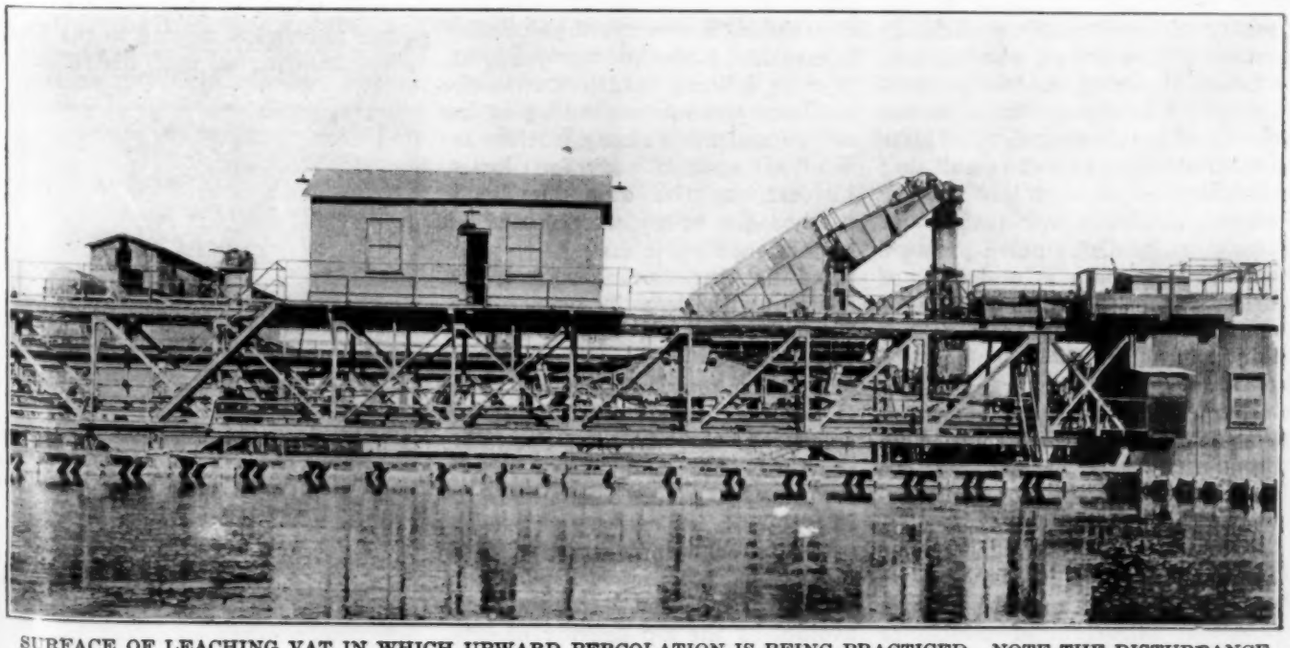
The velocity of percolation of solvent is a factor of the greatest importance in gravity-leaching operations. Assuming a pressure applied to the inflow that is equivalent to a column of liquor slightly exceeding in height the depth of the charge, the rate of percolation should be below the possible maximum. Contrary to popular impression, and assuming efficient displacement as the objective, coarser crushing does not permit a correspondingly higher rate of percolation; it leads to a greater disparity between maximum and minimum particle size, and this necessitates greater care in the avoidance of movement of colloid or slime.

It has been claimed in some quarters that channeling of solution is more likely to occur when downward

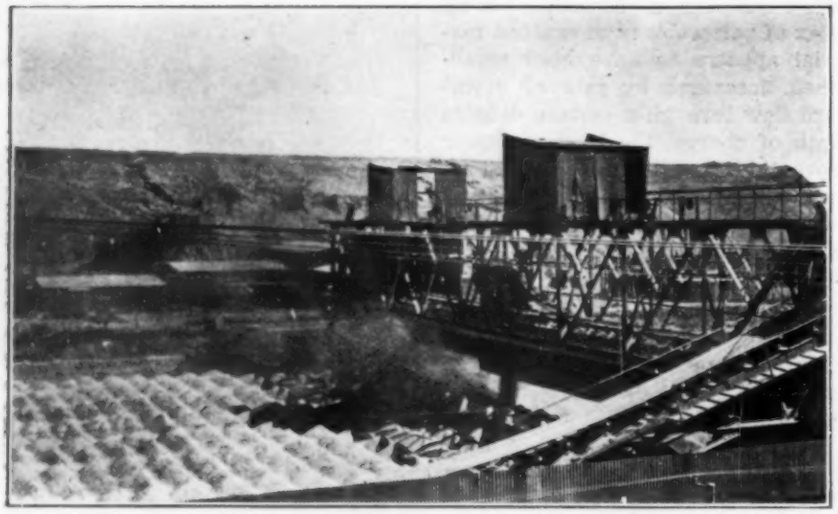


HEWLETT UNLOADER IN VAT AT AJO, ARIZ. NOTE UPRIGHT TIMBERS TO PROTECT LEAD LINING

percolation is practiced, but it is difficult to understand this viewpoint, especially when a high rate of flow is maintained. Much depends, of course, on the type of bottom chosen to support the ore. "Leaching" infers the passage of solution without disturbance or movement of the solid in the direction of flow. This is insured by (1) crushing to such an extent that a minimum of interstitial space exists between the particles, so there can be no movement of the finer material—not to such a degree that the flow of solution is impeded appreciably or deduced below an economic limit; (2)



SURFACE OF LEACHING VAT IN WHICH UPWARD PERCOLATION IS BEING PRACTICED. NOTE THE DISTURBANCE AT THE SURFACE CAUSED BY ESCAPE OF BUBBLES, WHICH MAY CONSIST OF CARBON DIOXIDE, FORMED BY THE ACTION OF THE ACID ON THE ORE



FILLING A 10,000-TON LEACHING VAT BY BELT CONVEYOR

an even distribution of the finest material, colloidal or granular, throughout the vat, so that resistance in percolation is uniform; (3) the provision of an adequate support for the charge, so that there is no movement of insoluble in the direction of solution flow at, near or beyond the support. Local collapse of fine material will occur if the support be inadequate, especially with downward percolation. This will result in cloudy or muddy effluents, a circumstance that must be recognized as an evidence of inefficient operation.

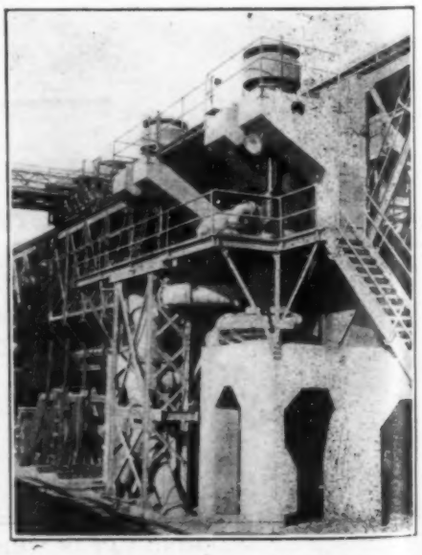
However, even when using an inadequate support, a local collapse at the juncture of ore and support may be avoided, and slime may be transported into the body of the charge, by practicing upward percolation at a rapid rate. But movement of the slime must lead inevitably to the packing of impermeable material in portions of the charge, where it acts as a dam, hindering the free and even passage of solution. An abnormal velocity of flow thereupon takes place in other sections, with the result that channeling occurs and the overflow becomes cloudy, if not turbid. If percolation by direct pump pressure be employed, there is a danger of fluctuation in the rate of flow of solution, and this is fatal to the maintenance of the standard of heterogeneity of the charge; the inclusion of air from the glands of pumps that are to force solution up through a mass of crushed ore is an occasional cause of short-circuiting.

When the distribution of fine material or colloid in the vat has been disturbed there is no hope of a successful extraction of soluble or an even percolation of solution, up or down. Thus it is that, under normal conditions, downward percolation is generally preferable to upward percolation, because an even pressure of solution is assured. Assuming that there is adequate support for the charge, and that the fundamental principles of leaching are observed, the solutions are clear; and the extraction of soluble is then dependent on the degree of crushing, which should provide adequate exposure or availability of the substance to be dissolved, and should insure a charge of even texture, with the minimum of interstitial spaces, so that the equilibrium of distribution is maintained throughout treatment.

When leaching with hot solution, however, another factor enters into consideration. Maximum concentration is usually desirable in the earlier stages of the process of extracting the soluble. If downward percolation be practiced from the commencement, there is difficulty in distributing the hot liquor evenly over the top of the charge and maintaining efficient insulation against radiation losses. Further, by the time the liquor reaches the space underneath the bottom support, it may be so saturated that there is danger of crystallization with drop in temperature. These troubles can be avoided to a large extent by practicing upward percolation, provided that the charge is not too finely divided. The insulation of the bottom of the vat is practicable, especially if a bucket-grab method of discharging residue is adopted. The delivery of the concentrated solution to crystallizer or other apparatus is facilitated and sundry deposition troubles are avoided by the top delivery of effluent. In case the exposure of the solution results in too rapid cooling, the surface can be protected by float insulators. Another advantage of upward percolation is that the ill effect of an excessive rate of percolation, or irregular distribution of charge, is followed immediately by the local discoloration of solution, which is easily observable. Remedial measures can then be taken promptly.

On the subject of a desirable ratio of soluble to insoluble in a leaching charge it would be unwise to generalize, but certain facts deserve consideration. If so much soluble material is extracted during leaching that there is a complete collapse of the charge, it is evident that the amount of gangue present should be increased. The feasibility of an increased use of diatomite or other inert insoluble in this connection is worthy of attention. On the other hand, the gradual settlement of the charge during leaching is by no means detrimental, provided the movement is even and regular. It is probable that the general rearrangement of the particles comprising the mass tends to insure the better exposure of soluble and the more efficient displacement of dissolved material by weak solution and water.

As an example of the efficient leaching of material containing about 20 per cent of soluble, I quote an instance in which a high extraction is being obtained by upward percolation with hot solution through an earth-rock, raw product crushed to ½ in. or so, during which the subsidence may amount to about 30 per cent of the original height of the charge, which is 10 feet. By adequate mechanical mixing in the first place, insuring an even distribution



ACID PUMPS USED IN COPPER LEACHING PLANT

GRAB BUCKET OPERATING IN LEACHING VAT AT CHUQUICAMATA, CHILE

of soluble, and by adopting a normal rate of percolation, the solutions are free from suspended matter and subsidence is gradual and momentarily unnoticeable, either in movement or in adverse effect on the operation. In such a case, however, it is necessary to provide a number of exits for the overflow effluent at successive levels, so that the subsidence of the charge can be followed at regular intervals by a decrease in the depth of supernatant solution. A floating, hinged discharge pipe, often miscalled a siphon, is not to be recommended. It interferes with the even percolation of the solution in that part of the vat, and is liable to become choked.

Much confusion has resulted, and a false conception of the process of leaching has been retained, because of the custom of referring to the support for the charge in a leaching vat as the filter bottom. To this confusion I confess to having contributed, by an unthinking repetition of a term established without due consideration of the fundamentals of practice.

The main purpose of the bottom on which the charge rests is to provide adequate support, preventing any movement of solids in the direction of solution flow when downward percolation is practiced, and permitting the even distribution of percolant when this is applied underneath the charge. It is designed to assist complete drainage when leaching is concluded, and to be capable of supporting the insoluble or unextracted residue against the application of a vacuum.

If the bottom support of a charge acted as a filter it would immediately choke, in consequence of low available pressure, when percolation was commenced. Disregarding the extraction of soluble from an exceedingly fine material—which is practicable only in exceptional cases, such as after roasting—a normal gravity-leaching charge contains only an infinitesimal proportion of fine slime externally, top or bottom. Given the proper conditions of operation, no movement of slime occurs in the direction of flow of the percolating solution. When this reaches the bottom support, no filtration is necessary.

Proof of this contention can be found in practice. If a charge is recognized to consist of a mass of material of mixed particle size and regular heterogeneity, it must be admitted that, assuming proper distribution in the first place, the structure at the bottom of the leaching vat will be identical to the structure at the top of the charge. Upward leaching on a commercial basis has been proved practicable — on the Chilean nitrate pampa, for example; and if correct conditions be observed (and these involve the observance of simple precautions) the overflow effluent is uncontaminated with colloid, earthy matter or gangue. Direct crystallization of a high-grade product is practicable. No filtration occurs after the solution leaves the charge. Conversely, if downward percolation be practiced, and the essential conditions be observed, there can be no appreciable filtration at the bottom support. The term "filter bottom" is a misnomer that has led to many false deductions in regard to the physics of gravity leaching and to improper practice in the application of the process.

The bottom support may be constructed of one or more materials. In some cases, an efficient bed for roasted material to be leached can be made with ashes. A refinement of this idea is seen in the provision of layers of stone, gravel and sand, in the order named, and so arranged that support and permeability are insured to the desired extent. This type of bottom is particularly useful in the case where hot leaching is practiced, where maximum temperature is necessary and where, for obvious reasons, no auxiliary heating equipment (such as steam coils) is desirable in the body of the charge or underneath the bottom support. In such case the stone or boulder base can be made to act as an accumulator of heat, being charged, before upward percolation is commenced, by live steam. By heating the ingoing solution to a maximum, and by utilizing the heat stored in the boulders to counteract unavoidable losses, a high degree of concentration may be secured in the primary effluent.

For operations involving small or medium sized vats (20 to 200 tons) with finely divided material such as classified sand, the bottom support must include some closely packed or woven material, to prevent local collapse of the charge. Slats are usually placed on the bottom of the vat to receive a grid, forming a platform on which may be laid coco matting or a material of finer mesh, or both. A special type of construction is seen in large vats, such as those at Chuquicamata, Chile, which are of 10,000-ton capacity. Timbers, each 6 by 6 in. are placed on a mastic floor of the vat, spaced at 18-in. centers. Planking, 2 by 6 in., spaced at 1½ in., is laid on this to receive coco matting. Shoveling slats (also 2 by 6 in.), at right angles to the lower planks, are spaced about ¾ in. apart. The tailing is removed by grab bucket or excavator.

The bottom of the 5,000-ton concrete leaching vats at Ajo, Ariz., is protected with lead sheeting, on which are placed, in the order named, 3 by 8-in. pine planks, edgewise, 5 by 12-in. joists and a planking of 2-in. timber, acting as support for the charge. This is punched at 2-in. intervals with ⅜-in. holes, countersunk from below. Upward percolation is practiced. The residue is removed by means of an unloader.

Equipment News

From Maker and User

Machine for Heading Barrels

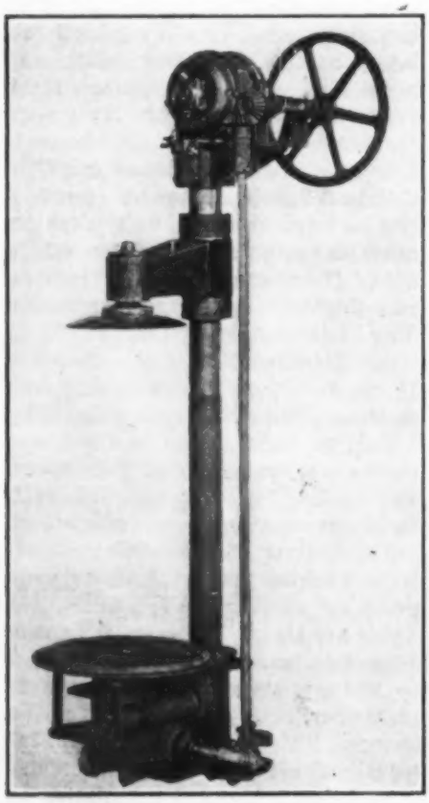
Hydraulic Press of Interest to Companies Packing Materials in Barrels

Because so many manufacturers of chemicals and similar products depend on the barrel when they need a container, there will be much interest in a new device for placing the heads in the barrels. This is manufactured by the Skinner Machinery Co., of Dunedin, Fla. It is a variation of the hydraulic press, which has been adapted to the purpose.

The machine is entirely self-contained and has a pump supplying pressure mounted directly on the base and connected by a short nipple to the base casting. There is a table attached to the main casting which is really a part of the hydraulic plungers. A steel upright at the back of this main casting carries the overhead heading piece which presses the head into the barrel. The overhead casting revolves out of the way so that it is very easy to place the barrel on the press.

The pedals in front and slightly to the right of the press table are operated by the foot and cause the table to rise and fall. Pressing the left hand pedal causes the table to rise; removing the pressure from this pedal stops the rising of the table and does not allow it to fall, so that the barrel will be held in any position desired. Pressing the right hand pedal causes the table to fall, releasing the barrel after the head is attached.

All of the valves are built into the base casting, eliminating all hazard of damage to the press by carelessness of an operator. As the pump is placed close to the base casting and attached to it, leaky joints have been largely avoided. The oil reservoir is part of the main casting and the valve in the main casting is of the rotary type. The pump can be driven either by belt or electric power.



SKINNER PARREL-HEADING PRESS

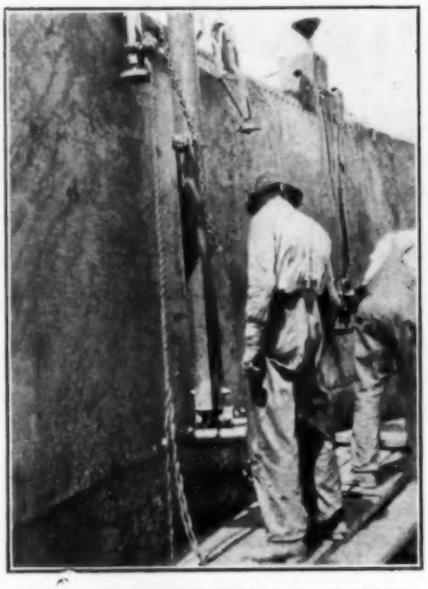


FIG. 1—YOKE RIVETER IN AN 80,000-BBL. TANK

Makes Tank Building Easy

Yoke Riveter Used to Construct Tanks on the Job Is Claimed to Give Improved Results

The yoke riveting machine developed by the Chicago Pneumatic Tool Co. should prove a boon to all chemical engineering industries if the results obtained by the pipe line and construction department of the Standard Oil Co. of California work out in other lines. This company has used the machines in constructing about thirty oil storage tanks, ranging from 69,000 to 80,000 bbl. capacity.

The tanks have from five to seven rings of 5-ft. sheets, with 1-in. hot-driven rivets at the bottom curve to ⅞-in. cold-driven rivets on the crown sheet. The rivets in the bottom plates and in the crown sheet were driven with the usual rivet gun. The remainder of the rivets were driven with the new yoke riveter, shown in Figs. 1 and 2.

This device is equipped with a traveling arm that rides on the top of the sheet. A small chain block is attached to this arm and the riveter is attached to this. Consequently, the operator can raise or lower the yoke as required. The crew to operate the yoke riveter consists of three men, one on the dolly side, one on the riveter side and a rivet heater.

With this equipment, from 700 to 1,200 rivets per day were driven at the tank farm of the S. O. Co. at La Mirada, Calif., depending on the size and "coming back" on every rivet. For instance, in the butt straps of a 75,000-bbl. tank there are 156 (⅞-in.) rivets on the first ring. These are "headed up," and after twenty-five or thirty are finished the riveter goes over them again, starting at the first one; then after the 156 are completed, they are gone over once more, cold.

The personal equation is eliminated, as the riveting is entirely automatic. Cut-outs and defective rivets are reduced to a minimum, probably to less than one-quarter of 1 per cent. The plates are drawn up tighter than is possible with hand riveting, the rivet hole is better filled and a water- or oil-tight tank results. Running leaks are conspicuous by their absence and a minimum amount of calking is necessary.

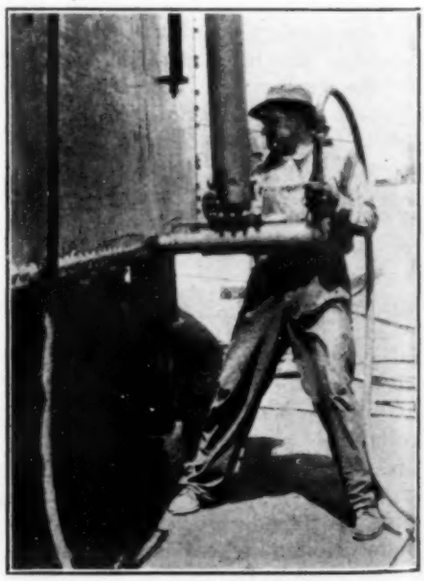


FIG. 2—CLOSING A BOTTOM SEAM WITH THE YOKE RIVETER

Interest Shown in Combustion Efficiency

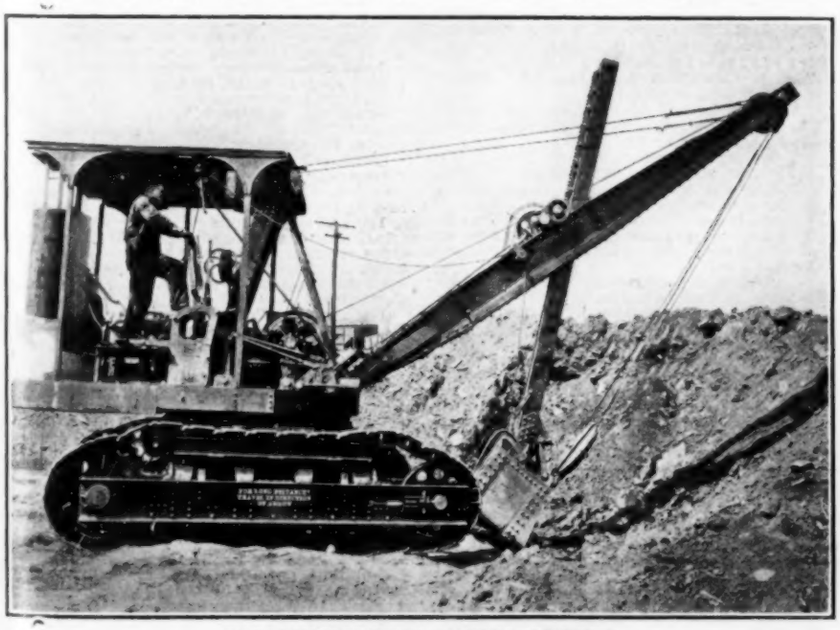
As an indication of the rapidly increasing interest in combustion and power plant efficiency among chemical plants, a note recently received from the Uehling Instrument Co., Paterson, N. J., is of interest.

According to this information, the California Cyanide Co. has just purchased sixteen Uehling CO_2 indicating units for its new plant at Huntington Park, Calif. The General Chemical Co. has purchased three Uehling CO_2 recorders for its East St. Louis Plant; it has three units at its Cleveland plant, two at its Edgewater, N. J., plant and eight at its Marcus Hook, Pa., plant. The Johns-Manville Co., which has Uehling equipment at its Manville, N. J., plant, has also just ordered a five-unit equipment for its new plant at Waukegan, Ill. Uehling Instrument Co. reports considerable demand for this equipment from other chemical companies, including the Atlantic Tar & Chemical Co., the Chemical Co. of America, the Butterworth-Judson Co. and the Vulcan Detinning Co.

Handling Raw Materials With a Gas Shovel

There are certain jobs in connection with handling the raw materials of the chemical industry where the power shovel is the only possible tool. In such places the steam shovel has long been successful and many are now in use.

There are, however, many locations where the user would rather depend on gasoline than on steam for power. To meet this need, the shovel shown in the accompanying photograph has been placed on the market. This machine is driven with a gasoline motor and operated entirely with gears and shafts. Full information in regard to it may be obtained from the manufacturers, Orton & Steinbrenner, 608 So. Dearborn St., Chicago, Ill.



GASOLINE-DRIVEN POWER SHOVEL

Radiant Heat Electric Furnace

A new furnace, su table for operating at temperatures up to 1,000 deg. C., has been placed on the market recently by Automatic & Electric Furnaces, Ltd., of London, England. This furnace is arranged for hand or automatic temperature control. It is put forward for use in tempering, carburizing, vitreous enameling, japanning and annealing; and may be used for glass and other materials as well as for metals.

The feature of this furnace is that it makes use of internal heaters, arranged in such a manner that the heat is uniformly radiated from the walls and the roof—also from the floor if so desired. The unit system of construction is employed and thus furnaces can be built of any size desired. No standard sizes are kept in stock, but the size wanted is made up from the units upon order.

Catalogs Received

E. G. HERBERT, LTD., Manchester, England—A new bulletin on the subject of the pendulum hardness tester, giving additional information concerning this device and supplementing the two catalogs recently noted in this column.

GENERAL ELECTRIC Co., Schenectady, N. Y.—Bulletin 47635. A new bulletin describing the types PQ-25 and PQ-26 under voltage relays, for use in tripping electrically operated circuit breakers when the voltage has decreased to a pre-determined value. Bulletin 43976—A new bulletin describing charging equipment for storage batteries used on industrial vehicles.

GRAVER CORPORATION, East Chicago, Ind. —Bulletin 501. A new bulletin describing the horizontal pressure type of water filter manufactured by this company for use in establishments where the quantity of water needed exceeds one quarter of a million gallons per day.

AMERICAN BLOWER Co., Detroit, Mich.—This company's general catalog, which gives a complete description of the various products manufactured, together with tables and design data necessary for the employment of this equipment.

CONNERSVILLE BLOWER Co., Connersville, Ind.—Catalog 21. A catalog describing details of the Connersville Positive Pressure Blower and giving information concerning a number of installations in which this blower has been applied.

STEERE ENGINEERING Co., Detroit, Mich.—Bulletin 39. A new bulletin describing the "backrun" gas-making process and listing some of the advantages obtained by its use.

ALLIS-CHALMERS MFG. Co., Milwaukee, Wis.—Bulletin 1118-B. A new bulletin describing the polyphase induction motors, type "AR" squirrel cage, manufactured and marketed by this concern.

MOTORBLOC CORPORATION, Philadelphia, Pa.—Bulletin S-101. A new edition of this company's publication on the motor-driven chain hoist, giving information on various applications of this equipment and also giving capacities, speeds, weights and motor sizes of the various types manufactured.

F. J. STOKES MACHINE Co., Philadelphia, Pa.—A new edition of this company's 1920 general catalog entitled "Vacuum Driers and Chemical Apparatus."

THE PERMUTIT Co., 440 4th Ave., N. Y. City.—Bulletin 105. A bulletin entitled "Water Filters and Filtration Equipment" which describes the design, construction and operation of the filtering equipment manufactured by this company.

THE BRISTOL Co, Waterbury, Conn.—Bulletin 319. A catalog describing the Bristol-Fuller Controller Valve manufactured and marketed by the Bristol Co. This new controller valve is for use with automatic temperature-controlling apparatus for the purpose of controlling the flow of air, gas, oil or steam.

THE FESSENDEN Co., Townsend, Mass.—A leaflet describing the kilndried barrels manufactured by this concern.

BAILEY METER Co., Cleveland, Ohio.—Bulletin 200. A bulletin describing the Bailey tachometer for indicating and recording speeds from a minimum of ½ r.p.m. to 6,000 r.p.m. Bulletin 161—A bulletin describing multi-pointer indicating gages for use with various pieces of control apparatus such as pressure gages, draft gages, water gages, thermometers, etc. These multi-pointer gages are so built that all of the various control instruments attached to a piece of apparatus will indicate on parallel scales on the same gage.

FILTRATION ENGINEERS, INC., New York City—A catalog describing the drying system which is composed of a filter and cake compressor manufactured by the Filtration Engineers, Inc., and a Proctor & Schwartz, Inc., automatic filter cake drier.

COMBUSTION ENGINEERING CORPORATION, New York City—Catalog L-1. A catalog describing the Lopulco system of burning powdered coal in power plants.

INSULITE CHEMICAL Co., Aurora, Ill.—Three pamphlets describing the various preparations of elaterite manufactured by this company for use in building construction for the purpose of making floors and walls waterproof and resistant to various forms of chemical corrosion.

WILLSON GOGGLES, INC., Reading, Pa.—A folder describing the new "Clipcup," a method for combining safety goggles with correction spectacles.

SULLIVAN MACHINERY Co., Chicago, Ill. —Bulletin 72-H. A new bulletin describing the Sullivan drill sharpener and the method of operating this equipment. Bulletin 77-G —A bulletin describing the Sullivan "WA-6" air compressors of the straight line type with simple steam and air cylinders and "Wafer" air valves. Bulletin 81-B—A bulletin describing the Sullivan Rotators, types DB-331, DP-321, DR-371. These are all types of one-man air drill used in the quarrying of rock, ore and other materials.

STOKER MANUFACTURERS ASSOCIATION, Philadelphia, Pa.—A booklet entitled "Coal, the Basic Fuel," treating of the general subject of coal combustion and stokers.

MANNING, MAXWELL & MOORE, INC., New York City—A new catalog entitled "A High Nickel Alloy." This catalog describes an alloy metal manufactured by the Ashcroft Manufacturing Co., a branch of Manning, Maxwell & Moore. The alloy is a copper-nickel mixture based on Monel metal and used as a heat and chemical resistant metal for castings.

Review of Recent Patents

Cellulose Plastics and Their Raw Materials

Activity in This Important Field Reflected by Number of Recent Inventions

PROBLEMS relating to the production of plastic masses from cellulose acetate and high-boiling solvents are considered by Henry Dreyfus, of London, England. In the operation of kneading or incorporating the cellulose acetate with the high-boiling solvents or plasticizers (with or without other usual or suitable ingredients) in the kneading or mixing apparatus, considerable difficulty is experienced and much power expended in obtaining a homogeneous mass in which the plasticizer is uniformly distributed, especially when relatively small quantities of plasticizer are used, owing to the fact that the volatile liquids and plasticizers act irregularly and locally on the mass in the mixing, with the result that the cellulose acetate is unevenly and not homogeneously attacked and that some parts of the cellulose acetate are dissolved while others are not penetrated and dissolved, or are only partly penetrated and dissolved, so that unattacked lumps or "eyes" form the mass and are more or less difficult to get rid of.

In order to obviate or reduce this difficulty, the kneading or mixing of the cellulose acetate with the high-boiling solvents or plasticizers (with or without other usual or suitable ingredients) is effected in the presence of such excessive quantities of a volatile liquid or liquids—such for instance as ethyl alcohol or methanol or mixtures thereof, which liquids or mixtures are themselves not solvents or are not good solvents for the cellulose acetate at ordinary or raised temperatures (though in certain reduced quantities together with the plasticizer they may exert a solvent action on the acetate)—that during the mixing or kneading the plasticizers or high-boiling solvents are present in so dilute a state that their solvent action on the cellulose acetate is prevented or more or less reduced and the mass can be easily kneaded or mixed to incorporate the constituents homogeneously and distribute the plasticizers uniformly throughout the mass so that the cellulose acetate is homogeneously impregnated by the plasticizer diluted in the volatile liquid or liquids as a vehicle or carrier, after which the volatile liquids or diluents are evaporated or expelled, and in proportion as this is effected the solvent action on the cellulose acetate increases so that this is more and more dissolved and plasticized until finally not any or only very little volatile diluent remains in the concentrated or stiff celluloid solution.

By means of this process it may even be possible to dispense with the rolling operation ordinarily employed in the celluloid industry to obtain further mixing. (1,466,819; Sept. 4, 1923.)

Making Cellulose Acetate

Two patents cover improvements in the technology of acetylizing cellulose. Patent 1,466,329, granted to Harry P. Bassett, of Cynthiana, Ky., on Aug. 28, 1923, may be illustrated by the following example:

The acetylizing mixture is prepared in substantially the proportions of 300 parts of 80 per cent acetic anhydride (20 per cent acetic acid), 1,200 parts of benzol and 10 parts of 5 per cent sulphuric acid. As stated, other acid may be employed in place of sulphuric acid, such as benzene sulphonic acid, phosphoric acid and other mineral acids and acid salts. In place of benzol, toluol and other coal-tar products may be employed. The cellulose to be treated, preferably in a purified condition, such as bleached cotton linters, is then added to the mixture, the acetylizing mixture being employed in excess of the theoretical requirements.

This mixture is allowed to stand until tests show that the cellulose has been completely acetylized, or acetylized to the desired degree. In actual practice, a period of about 18 hours is generally sufficient for acetylizing. The cellulose acetate formed is separated in any suitable manner from the excess acetylizing mixture. The use of a centrifugal machine for separating the cellulose acetate is advantageous. Upon separation, the cellulose acetate is washed, dried and treated in any

American Patents Issued September 25, 1923

The following numbers have been selected from the latest available issue of the *Official Gazette* of the United States Patent Office because they appear to have pertinent interest for *Chem. & Met.* readers. They will be studied later by *Chem. & Met.'s* staff, and those which, in our judgment, are most worthy will be published in abstract. It is recognized that we cannot always anticipate our readers' interests and accordingly this advance list is published for the benefit of those who may not care to await our judgment and synopsis.

1,468,632—Apparatus for the Manufacture of Aluminum Chloride. F. W. Hall, Port Arthur, Tex., assignor to Texas Co., New York.

1,468,649 — Process for Electrically Treating Liquids. H. B. Rudd, Mansfield, Ohio.

1,468,679—Concentrating Evaporator. T. M. Skinner, Jr., Douglas, Wyo.

1,468,693—Bleaching Paper Pulp. J. C. Baker, Nutley, N. J.

1,468,695—Water-Supplying Device for Pulp-Screening Machines. A. H. Börresen, Mjondalen, and K. Holter, Skoien, near Christiania, Norway.

1,468,708 — Process for Performing Chemical Reactions. W. Kochmann, Charlottenburg, near Berlin, Germany.

1,468,739—Process and Apparatus for Mixing Liquids and Gases. W. Paterson, London, England.

1,468,740—Centrifugal Separation and Centrifugal Filtration of Liquids. C. F. Paul, Jr., Austin, Tex.

1,468,741 — Production of Phosphoric Acid. S. Peacock, Wheeling, W. Va., assignor to W. G. Waldo, Washington, D. C.

1,468,746 — Hotwell Ejector. H. F. Schmidt, Swarthmore, Pa., assignor to Westinghouse Electric & Manufacturing Co.

1,468,747 — Leakproof Valve. E. K. Shoultz, Vincennes, Ind.

1,468,759—Apparatus for Crushing or Reducing Minerals, Ores and Other Materials. H. A. Stockman, Johannesburg, Transvaal, South Africa, assignor of one-half to W. E. Bleloch, Johannesburg, Transvaal, South Africa.

1,468,792—Method of Recovering Oxalic Acid. E. A. Barnes, Oakland, Calif., assignor to California Cap Co., Oakland.

1,468,805—Isomeric Product of Reduction of Oxycodeinon and Process of Preparing the Same. M. Freund, deceased, late of Frankfort-on-the-Main, Germany, by W. Freund, administrator, Frankfort-on-the-Main, and E. Speyer, Frankfort-on-the-Main.

1,468,838—Cathode for the Electrolytic Refining of Metals. C. H. Schuh, Brooklyn, N. Y.

1,468,875—Rotary Screen for Paper-Making Machines. R. S. Clarke, Walpole, Mass., assignor to Bird Machine Co., Walpole, Mass.

1,468,889 — Multistage Rotary Pump. H. R. Trotter, Swarthmore, Pa., assignor to Westinghouse Electric & Manufacturing Co.

1,468,893 — Pulverizing Mill. F. H. Wolever, Chicago, Ill.

1,468,899—Fractional Distilling Apparatus. E. A. R. Chenard, deceased, Bordeaux, France, by J. A. Chenard, executor, Bordeaux.

1,468,900—Process and Apparatus for Measuring the Elastic Properties of Plastic Materials, Farinaceous Pastes and the Like. M. Chopin, Nancy, France, assignor to himself and Société d'Entreprise Meunière, Paris, France.

1,468,930—Electrical Cement. A. P. Sullivan, St. Marys, Pa., assignor to Stackpole Carbon Co.

1,468,932—Reversing Blower Kiln. R. Thelen and H. D. Tiemann, Madison, Wis., dedicated, by mesne assignments, to the People of the United States of America.

1,468,960—Method of Making Abrasive Articles of Manufacture and Product. F. J. Crupi, Brooklyn, N. Y., assignor to Herman Behr & Co., Inc., Brooklyn.

1,468,961—Extraction Apparatus. H. J. Cary-Curr, Chicago, Ill., assignor to E. H. Sargent & Co., Chicago, Ill.

1,468,989—Process and Apparatus for Dispensing Liquids. R. Black, Gem, Neb.

1,468,988—Process for Utilizing Gases Containing Hydrogen Sulphide in the Separation of Metals. C. Berthelot, Paris, France.

1,469,007-8—Amalgamator and Separator. C. Meyer and H. B. Meade, Los Angeles, Calif., assignors to E. A. Gillespie, Los Angeles.

1,469,044—Tanning Hides. A. Lüttringhaus and L. Blangey, Mannheim, Germany, assignors by mesne assignments, to Badische Anilin & Soda Fabrik, Ludwigshafen-am-Rhine, Bavaria, Germany.

1,469,052 — Flame-Measuring Device. J. B. Rather, Brooklyn, N. Y., assignor to Charles J. Tagliabue Manufacturing Co., Brooklyn.

1,469,086—Centrifugal Fan and Method of Making the Same. N. H. Henderson, Syracuse, N. Y.

1,469,128 — Combined Coating and Winding Machine. J. J. Weldon, Pittsfield, Mass., assignor to General Electric Co.

1,469,178 — Apparatus for Supplying Heat. C. Ellis, Montclair, N. J., assignor by mesne assignments, to Surface Combustion, Inc., Wilmington, Del.

Complete specifications of any United States patent may be obtained by remitting 10c. to the Commissioner of Patents, Washington, D. C.

other manner desired for placing it in condition for the market.

The recovered acetylizing mixture is first distilled to recover the toluol or other diluent. The residue is then treated with sulphur chloride and dry chlorine gas is led into the mixture for sufficient length of time to permit complete reaction between the chlorine gas and the acetyl radicle. During the chlorine treatment, a small amount of monocloracetic acid is formed which is separated from the acetyl chloride formed and recovered for use in the arts.

The acetyl chloride is then treated with sodium acetate and distilled to form acetic anhydride.

Another Suggestion for Cellulose Acetate

Improvement in the preliminary treatment of cellulose to facilitate acetylation is suggested by Johannes M. Kessler, of West Orange, and Virgil B. Sease, of Newark. A mass of cellulose fiber of known weight is placed under pressure in a suitable press and the liquid which is to be incorporated in the cellulose is forced through it, the pressure to which the cellulose is subjected being so adjusted that the cellulose will retain a desired amount of the liquid—that is, this amount of liquid will be sufficient to saturate the cellulose. The liquid to be thus incorporated is usually acetic acid of 98 to 100 per cent strength, either alone or mixed with acetic anhydride.

After impregnating the cellulose the resulting mass is placed in an acetylating bath in which the amounts of reagents are preferably such as to give to the complete mixture the following composition: 100 parts cellulose, 1 to 4 parts water, 600 parts acetic acid (glacial), 250 parts acetic anhydride, 10 parts sulphuric acid.

The mixture is vigorously stirred and cooled to room temperature or lower. At 25 to 30 deg. C. a clear very viscous solution without traces of fibers is obtained in 3 or 4 hours. About 100 parts of water, 200 parts of acetic acid and about 10 parts of sulphuric acid are added, and after thorough stirring the temperature is raised to about 60 deg. C. and maintained at about this point for 2 or 3 hours, at which time the resulting cellulose acetate will be found to be soluble in hot benzene-alcohol, commercial ethyl acetate, aqueous alcohol and other organic solvents. The cellulose acetate is then precipitated and washed free from impurities.

By following the procedure above outlined the quantity of acetic acid or acetic anhydride employed for a given weight of cellulose is but slightly more than the quantity ultimately incorporated in the cellulose; the handling of the materials is facilitated; loss of acetic acid and acetic anhydride by evaporation is avoided and the workmen are not subjected to obnoxious and irritating vapors as they are when carrying out the old process. (1,466,401; assigned to E. I. du Pont de Nemours & Co.; Aug. 28, 1923.)

Drying Alkali Cellulose

The preparation of alkali cellulose for the manufacture of cellulose ethers has presented several difficult technical problems, the present invention being a solution of one of these. The requirements of the cellulose ether reaction, especially when the etherifying agent is an alkyl halide, call for a thorough and intimate admixture of cellulose, alkali and water in the correct proportions. A simple and desirable way to bring about this combination is to soak the cellulose in a strong aqueous solution of the alkali. But while this brings the ingredients into intimate contact, such a result is obtained only by the use of larger amounts of water than are desirable during the etherification, especially in certain methods where the water present during the reaction is less than the weight of the alkali.

The removal of this excess of water has been found to be unexpectedly difficult. Pressure methods squeeze out too much alkali along with the water, making necessary the additional step of thoroughly mixing in solid alkali. This can be successfully done, but it is desirable to simplify the process and avoid this extra operation. It has been also proposed to treat the excessively moist alkali cellulose in a vacuum drier or to distill it with benzol. These methods have been found to be too long and expensive from the manufacturing standpoint. If the material be merely heated in the open air to drive off the excess of moisture, it has been found that the alkali reacts upon the cellulose and degrades it so rapidly that when the desired amount of moisture is removed the cellulose is unsuitable for the production of flexible film-forming cellulose ethers. The excessively degraded cellulose yields only brittle ether products.

By studying the rates at which different methods of drying remove the excess of water and then comparing them with the rate of degradation of the cellulose by the alkali at different temperatures, Edward S. Farrow, Jr., of Rochester, N. Y., has discovered that the excess of water can be quickly and cheaply removed from the alkali cellulose without correspondingly accelerating the rate of degradation of the cellulose if a rapid current of hot dry gas or air be passed in contact with the alkali cellulose. In other words, this system of drying accelerates the rate of alkali action far less than it accelerates the drying action. The removal of the excess water can thus be completed before the general mass of the alkali cellulose is impaired. (1,467,107; assigned to Eastman Kodak Co.; Sept. 4, 1923.)

Cellulose-Ether Plastics

A whole group of patents (1,467,091 to 1,467,105 inclusive) granted Sept. 4, 1923, to Stewart J. Carroll, of Rochester, N. Y., and assigned to Eastman Kodak Co., cover compounds which will act as solvents or plasticizers for cellulose ethers. The following are mentioned: Mixture of methyl acetate and monochlornaphthalene; dibenzylamine with methyl acetate; ethyl benzene; dimethylaniline; diphenylmethane with methyl acetate; ethyl benzylaniline; cyclohexanol; acetophenone; ethyl iodide; ethylene bromide; cyclohexanone; methylene chloride; butyl tartrate; benzaldehyde; ethylene trichloride with ethyl alcohol.

Important Articles in Current Literature

More than fifty industrial, technical or scientific periodicals and trade papers are reviewed regularly by the staff of *Chem. & Met.* The articles listed below have been selected from these publications because they represent the most conspicuous themes in contemporary literature, and consequently should be of considerable interest to our readers. A brief résumé of each article is included in the reference given. Since it is frequently impossible to prepare a satisfactory abstract of an article, this list will enable our readers to keep abreast of current literature and direct their reading to advantage. The magazines reviewed have all been received within a fortnight of our publication date.

USE OF FILLERS IN PAPER MAKING. Raymond and Bonnet. French technologists discuss various materials used as fillers and the characteristics of each; loading substances; technique of control. *Paper*, Sept. 19, 1923, pp. 5-8.

THE VALUE OF CARBON DIOXIDE IN AIR BAGS. Henry R. Manor. The question of air bag oxidation, especially as met in the rubber industry, explaining the effect on stock, migration of sulphur, cost and life of bags, etc. *India Rubber World*, Oct. 1, 1923, pp. 17-18.

IMPROVEMENT IN SULPHITE COOKING METHODS. C. V. S. Hawkins. A description of the Decker process for relieving from one digester to another, thereby saving heat and increasing digester efficiency. *Pulp & Paper Magazine*, Sept. 25, 1923, pp. 955-956.

NEW DYESTUFFS INDUSTRY OF GREAT BRITAIN. Prof. Gilbert T. Morgan. A summary of the growth of the industry in England from the pre-war period to the present, when 40,000 tons per year is its capacity. Separate classes of dyes are considered individually and the relation of the dyestuffs to the explosives industry in Britain is emphasized. *Chemistry & Industry*, Sept. 14, 1923, pp. 868-874.

USING MANGANIFEROUS IRON ORES. L. E. Ives. A description of the advantages of high-manganese iron ores which blast-furnace operators are beginning to appreciate. *Iron Trade Review*, Sept. 13, 1923.

METHODS OF WATER PURIFICATION. J. P. O'Callaghan. A review of the leading methods which are successfully practiced at the present time in the treatment and purification of water supplies. *Chemical Age* (London), Sept. 15, 1923, p. 280.

HOW WOOD IS MADE INTO PAPER. A very brief description of the manufacture of newsprint paper. *Mining & Metallurgy*, September, 1923, p. 469.

UTILIZATION OF METHANE GAS FROM IMHOFF TANKS. Dr. Ing. Karl Imhoff. A description of 1 year's experience at Essen-Rellinghausen indicates gas production of 0.3 cu.ft. per capita daily. *Engineering News-Record*, Sept. 27, 1923, pp. 512-514.

LA PRÉPARATION INDUSTRIELLE DE L'ALCOOL. Eugène Grandmougin. The third and concluding part of this article on industrial alcohol manufacture. *Le Génie Civil*, Sept. 15, 1923, pp. 246-248.

STEEL CASTINGS FOR SUGAR MILLS. Harry J. Barton. Developing an alloy steel to withstand high pressure. Its manufacture, heat-treatment and properties. *Iron Age*, Sept. 27, 1923, pp. 822-825.

Obtaining Byproducts From the Cement Kiln

Recent Patent Provides a Means for Removing the Dust From the Waste Gases of Cement Kilns, Recovering Byproducts From These Gases and Extracting Their Heat

THE method and apparatus for removing the dust from the waste gases of cement kilns and thereby recovering a valuable part of the material originally fed into the kiln has been patented by David S. Jacobus (1,463,363, assigned to Babcock & Wilcox Co.). In addition to removing the dust, this patent also details a means of recovering certain byproducts from the waste gases and also extracting their heat by means of waste-heat boilers.

Over the higher ends of one or more rotary cement kilns is placed a common dust-settling flue, having hoppers between the kilns. One side of this flue is connected with the cement kiln stacks through openings, controlled by dampers. When the kilns are discharging into the flue, these dampers are entirely removed, and the openings where they were are covered with tiles. To regulate the flow of gases from the kilns to the flue and equalize the flow between the various kilns, bricks or tiles are introduced into the connecting opening through an appropriate door.

Experiments with these systems have shown that with certain grades of raw material some of the dust from the kilns will collect in caked form on hot surfaces, and that this caked material contains potash salts and other ingredients which make it valuable. It is therefore important to collect as much as possible of this caking material, as it may be sold at a much higher price than the finished cement.

In the apparatus inwardly projecting wing walls are provided, which cause eddies to form in the dust-carrying gaseous current, which assists both in the deposition of dust in the hoppers and in the deposition of the caking material on the sides of the flue. The sides of the flue and the wing walls become heated by the gases, and the caking material adheres to such hot surfaces.

The part of the dust adhering or caking to the hot surfaces has a different chemical composition from the rest of the dust which will not so adhere. It is therefore possible by means of the apparatus to effect a separation of the dust having the caking characteristics from the remainder of the dust, thus recovering a valuable byproduct from the cement kiln dust. The caked material is removed from the walls by means of scrapers, suspended from chains which are raised and lowered by a windlass mounted above the flue.

From the flue the hot gases pass through a heat-absorbing device, which reduces their temperature, before passing to the apparatus beyond, in which the final separation of the dust is effected. The heat-absorbing device is preferably one in which the waste heat is utilized, being of the general Babcock & Wilcox boiler type with three vertical passes, beneath which are located dust hoppers to collect the dust dropping from the gases passing through the boiler.

The waste heat boiler effects a considerable reduction in the temperature of the gases, and therefore their volume, thereby reducing the velocity of the gases and permitting the dust to be more readily separated therefrom, not only during the passage of the gases through the passes of the boiler, but also in the dust separator system through which the gases are afterward passed to effect the final separation of the dust. Because of the cooling of the gases, the dry dust separators beyond the boiler have gases of less volume and consequently of less velocity to handle. Moreover, the washers through which the gases subsequently pass operate much more satisfactorily on the cooled gases, as very hot gases tend to evaporate and carry away the spray water in the form of steam and interfere with the satisfactory operation of the washers generally. Also, the cooled gases are much more readily handled by the fan. In cases where the final removal of the dust is effected by electrical means, the reduction in temperature of the gases is of great advantage.

Men in the Profession

GEORGE D. DOWNS, formerly president of the Lackawanna Coal & Steel Co., now a director of the British Empire Steel Corporation, will take a prominent place in the direction of the affairs of the corporation. It is rumored that Mr. Downs will take the vice-president's post, vacated by D. H. McDougall.

E. V. ESKESEN, president of the New Jersey Terra Cotta Co., New York, has returned from an extended visit to Denmark and other European countries.

RICHARD FISHER, formerly of the chemistry department of the University of Illinois, has accepted a position as research chemist at the laboratories of the Combustion Utilities Corporation in Long Island City, N. Y.

G. F. LOUGHLIN, head of the Mineral Resources branch of the U. S. Geological Survey, is in Michigan, where he is conferring with B. S. Butler concerning the continuation of the survey of the Lake Copper district.

EARL R. MALTBY of Tonawanda, N. Y., Thomas E. Boyd and Harry Willis of Buffalo have incorporated under the trade name of the Bilt-Rock Board Co., for the purpose of manufacturing a new type of plaster board. The old plant of the Transfer Lumber & Shingle Co. has been purchased by the new company for its manufacturing purposes.

WILLIAM J. PRIESTLEY has recently been appointed metallurgical engineer for the Electro-Metallurgical Sales Corporation, New York.

R. P. KITE, of the Dorr Co., engineers, has been transferred from the New York office to the Chicago branch. 38 South Dearborn St., where he will work with J. V. Slade.

WILLIAM B. PLUMMER, formerly research chemist for the Grasselli Chemical Co., is now associated in the same capacity with the Combustion Utilities Corporation, Long Island City, N. Y.

Dr. F. W. SULLIVAN, JR., has been transferred from the Casper, Wyo., refinery of the Standard Oil Co. (Indiana) to become assistant director of research at the Whiting, Ind., refinery.

R. BROOKS TAYLOR, general superintendent at the plant of the Speer Carbon Co., St. Marys, Pa., gave an interesting address before the members of the Industrial Club of the Elk County Manufacturers' Association, Johnsonburg, Pa., at its annual meeting, Sept. 24, on "What Constitutes a Good Foreman."

NORMAN WATKINS, general manager of the Pacific Guano & Fertilizer Co., is at San Francisco, Calif., making an inspection of the local plant of the company.

Calendar

AMERICAN GAS ASSOCIATION, annual convention, Atlantic City, Oct. 15 to 20.

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, winter meeting, Washington, D. C., Dec. 5 to 8.

AMERICAN MANAGEMENT ASSOCIATION, Hotel Astor, New York, Oct. 29 to 31.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS, annual meeting, New York City, Dec. 3 to 6.

AMERICAN SOCIETY OF REFRIGERATING ENGINEERS, annual convention, New York City, Dec. 3 to 5.

AMERICAN SOCIETY FOR STEEL TREATING AND INTERNATIONAL STEEL EXPOSITION, Motor Square Garden, Pittsburgh, Pa., Oct. 8 to 13.

NATIONAL ASSOCIATION OF PRACTICAL REFRIGERATION ENGINEERS, fourteenth annual convention, Memphis, Tenn., Dec. 12 to 16.

NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING, Grand Central Palace, New York, Dec. 3 to 8.

SOCIETY OF AUTOMOTIVE ENGINEERS, annual meeting, simultaneously with the Detroit Automobile Show, General Motors Bldg., Detroit, Mich., Jan. 22 to 25, 1924.

TECHNICAL ASSOCIATION OF THE PULP AND PAPER INDUSTRY, Appleton, Wis., Oct. 25 to 27.

News of the Industry

Summary of the Week

Chemical Foundation answers charges of government in patent suit and requests retraction and open apology.

Niagara's chemical industry is growing rapidly, expanding in many lines.

Non-corrosive compound invented in England to be manufactured in Buffalo.

Relief organized for families of Bureau of Standards victims who were in explosion on Sept. 20.

American welders to meet in Pittsburgh, Oct. 24 to 26, 1923.

Imports of coal-tar dyes in September were smaller than for any preceding month of the year.

Tariff Commission will investigate production costs of amino acids and salts.

Department of Foreign and Domestic Commerce opens office in Kobe.

Spain reported ready to make tariff treaty with U. S.

Arsenic is holding up in price, with contract offerings restricted both by producers and importers.

Fertilizers, Gums and Oils Prominent in Import Trade for August

A STUDY of the preliminary figures showing the foreign trade of the United States in chemicals and allied products for August, 1923, reveals the fact that although the exports represented a gain of 23 per cent as compared with August, 1922, there was a decided drop from the previous months of 1923. On the other hand, the imports during August, 1923, not only gained over August, 1922, but also over the preceding month. The exports of chemicals and allied products had an aggregate value of $11,943,966, while the imports totaled $16,045,609.

The large increase in imports may be accounted for in part by the exceedingly large receipts of china wood oil (more than $2,000,000 worth), of fertilizers (nearly $5,000,000 worth) and of gums, resins and balsams (nearly $3,000,000 worth). It will be observed that these three classes account for approximately $10,000,000 of the $16,000,000 of the import trade.

It is rather characteristic of the export trade for this period that many of the groups and individual commodities recorded expansions as compared with August of last year, but losses as compared with July of this year.

Coal-Tar Chemicals—The exports of coal-tar products advanced from a total valuation of $579,165 in August, 1922, to $877,670 in August, 1923, but this figure was less than half of the July, 1923, figure, and was below that for any previous month of 1923 except January. The imports likewise increased from $940,216 in August, 1922, to $1,083,432 in August, 1923, although this figure was the smallest of the year. During August of the current year, the relative position of the coal-tar chemicals trade was reversed from July, as imports in August again were in excess of the exports. This expansion in imports may be attributed to the heavy receipts of coal-tar crudes, when 3,586,488 gal. ($567,589) of dead or creosote oil and 963,775 lb. ($28,402) of naphthalene came into the United States.

Of the finished coal-tar products groups less quantities were received this year than last and exports were above imports. The exports of coal-tar colors, dyes and stains in August, 1923, amounted to 1,008,878 lb., with a value of $388,815; of coal-tar medicinals to 29,409 lb., $17,675; of photographic chemicals to 25,129 lb., $14,699, and of all other finished coal-tar chemicals to 273,049 lb., $26,267.

Fertilizers—A big jump in the value of the imports and a drop in the value of the exports characterized the foreign trade in fertilizers and fertilizer materials during August, 1923, as compared with August, 1922.

The total imports rose in value from $3,777,755 in August, 1922, to $4,888,570 in August, 1923, but declined in quantity from 158,793 tons to 153,820 tons. Receipts of sodium nitrate advanced from $1,772,195 (42,474 tons) to $2,797,362 (156,637 tons). In contrast to this, potash fertilizers fell off both as to quantity and value.

The total exports of fertilizers decreased from $1,517,125 (97,454 tons) in August, 1923, to $1,321,417 (95,326 tons) in August, 1923, and were a little less than half the value of those of July of this year.

Shipments of sulphate of ammonia and of superphosphates in August were considerably under those for either August of last year or for July of this year. Phosphate rock recorded a gain in quantity but a loss in value.

Paints, Pigments and Varnishes—The foreign demand for American paints, pigments and varnishes continued the healthy growth that had been in evidence month by month throughout this year until in August shipments to the value of $1,743,112 surpassed those of any previous month of this year and nearly doubled those for August of last year. Domestic requirements for foreign paints, on the other hand, continued to be small as in August, 1923, but $244,158 were entered the United States.

Although exports of mineral earth pigments registered an increase over August of last year and over July of this year, the large improvements recorded for the group as a whole may be attributed to the good demand for all chemical pigments except lithopone. Carbon and lamp blacks and prepared paints, stains and enamels showed an especially favorable trade. Oil varnishes were reduced slightly from July's figure, but were in excess of August's figure of last year.

Explosives—More than double the quantity of explosives (2,253,460 lb., valued at $487,055) was sent abroad in August of this year than in August of last year, and nearly four times the amount of the July figure. The shipments exceeded those for any other month in 1923 except March. Over half the total value was composed of smokeless powder (813,122 lb., $260,836) and two-fifths was dynamite (1,223,332 lb., $198,584).

Miscellaneous Chemicals—The most significant change occurring in the exports of miscellaneous chemicals was made in glycerine, which took a sudden spurt from 132,143 lb., worth $31,834, in July, 1923, to 357,043 lb., worth $55,-

536, in August, 1923, and surpassed the shipments in August, 1922, by nearly 300 per cent in value. High as this figure was, it was still considerably below the import figure of $95,924 (980,101 lb).

Shipments of ammonia and ammonium compounds, acetate of lime, calcium carbonate, bleaching powder, copper sulphate, dextrine and potassium chlorate have all continued the reductions evident throughout the current year. Sodas and sodium compounds advanced from $794,561 (28,454,019 lb.) in August, 1922, to $882,442 (37,654,207 lb.). Foreign sales of American methanol and denatured alcohol fell short of July, 1923, and August, 1922, figures.

Receipts of arsenious acid or white arsenic in August amounted to 1,335,402 lb., valued at $115,369; of citric acid to 67,200 lb., valued at $17,719; of oxalic acid to 160,402 lb., valued at $11,925. Imports of crude, potassium bitartrate, argols or wine lees dropped from 2,756,196 lb., valued at $202,452 in August, 1922, to 1,254,252 lb., valued at $94,557, in August, 1923.

Naval Stores, Gums and Resins—Heavier shipments of naval stores, gums and resins were dispatched from the United States to foreign countries in August, 1923, than in August, 1922, the exports having risen from $1,450,900 to $2,147,485. Although the exports of rosin in August, 1923, exceeded those for August, 1922, they fell below those for any previous month of the current year. Spirits of turpentine, on the other hand, nearly doubled those of August, 1923, and surpassed the shipments in the earlier months of this year.

The imports of gums, resins and balsams expanded 45 per cent, from an aggregate value of $1,874,152 in August of last year to $2,718,211 in August of this year. Nearly one-half of the total receipts of this class was made up of shellac, which more than doubled in value until 2,728,202 lb., valued at $1,436,151, was entered the United States.

Vegetable Oils—The foreign demand for American essential oils in August of this year exceeded that for August of last year, having risen from 51,573 lb., valued at $65,562, to 58,120 lb., worth $74,466. In contrast to this, however, the American purchases of this type to the value of $297,372 were less than the August, 1922, figure of $353,156 and were but two-thirds of the July figure.

In August, 1923, the imports of china wood oil amounted to 1,757,645 gal., with a value of $2,325,156, and of linseed oil to 4,816,354 lb., with a value of $569,629.

Logwood and Dyeing Extracts—The large receipts of logwood, equaling 6,169 tons, valued at $105,426, were considerably above those for both last year and this year. Purchases from foreign countries of extracts for dyeing, coloring, etc., exceeded those for August of last year, but were under those for June and July of this year; 306,685 lb., worth $22,343 was received.

U. S. Flaxseed Production Inadequate for Country's Requirements

Department of Agriculture Considers Possibility of Increasing Acreage—Current Yield Less Than 50 Per Cent of Estimated Consumption

THE possibility of increasing the acreage of flaxseed in the United States by shifting from wheat and other crops is now receiving the consideration of the Department of Agriculture. With an estimated flaxseed crop of 11,700,000 bu. in 1922, the United States produced less than one-third its domestic requirements. In 1923 the estimated production of 19,400,000 bu. will be less than 50 per cent of the estimated requirements, calculated on the same basis as the net supply for the fiscal year ended June 30, 1923. If, therefore, our requirements for the current fiscal year are equal to those of last year, it means that at least 20,000,000 bu. of flaxseed, or its oil equivalent, will be imported from abroad.

In 1922 at least 2,996,506 additional acres would have been required to produce the equivalent of our net imports of flaxseed and linseed oil during that year. This additional acreage is based upon an average yield per acre of 9.3 bu., the average acre yield for the year. In 1923, 2,372,648 additional acres would have been required to produce the 20,000,000 bu. which it is estimated will represent our net import trade requirements during the current fiscal year, or a total acreage of 4,657,648 acres. This estimate is based on an average yield per acre of 8.5 bu., according to the September government crop forecast.

Principal Producing States

Flaxseed is essentially a pioneer crop, thriving on the frontier and moving with it. The most important flax-producing region in the United States at the present time is in the northern Great Plains area, embracing the states of Minnesota, North Dakota, South Dakota and Montana. In 1922 these four states produced 11,385,000 bu., or 98 per cent of the total flaxseed production of the United States. In 1923 the estimated production of these four states is 19,036,000 bu., or 99 per cent of the estimated flaxseed crop of the United States.

Whether the United States can produce a sufficient quantity of flaxseed to meet its own requirements depends not only on the amount of suitable land available for the raising of flaxseed but also upon the relation between the cost of production of flaxseed and other farm products and the prices received for them, not to mention the tariff, transportation costs and other competitive factors that enter into the consideration of this problem.

The net requirements of flaxseed in the United States, including linseed oil converted to flaxseed, during the fiscal year ended June 30, 1923, totaled 39,567,514 bu., an increase of 29 per cent over the preceding fiscal year, when net requirements were 30,507,807 bu. The annual average net requirements of flaxseed of the United States during the period from 1911 to 1922 was 28,117,000 bu. This includes the seed equivalent of linseed oil.

Imports Reach New High Mark

Imports of flaxseed into the United States during the fiscal year ended June 30, 1923, were 25,000,000 bu., an increase of 83 per cent over the fiscal year ended June 30, 1922, when imports totaled 13,600,000 bu. In 1913 the imports for the fiscal year aggregated 5,300,000 bu. Imports during the last fiscal year exceeded those of any preceding year. The last previous high record was in 1919, when imports reached 23,300,000 bu.

Argentina was the principal source of the flaxseed imports during the past year. Of the total imports during the year under review, 22,330,931 bu., or 89 per cent, came from Argentina. Imports from Canada amounted to 2,191,103 bu., or 9 per cent of the total. Of the remainder, approximately one-half, or 220,778 bu., came from China.

Linseed Oil Imports Drop

Imports of linseed oil during the fiscal year ended June 30, 1923, amounted to 7,568,497 gal., the equivalent of 3,027,399 bu. of seed and a decrease of 66 per cent from the fiscal year ended June 30, 1922, when the imports of linseed oil amounted to 22,494,051 gal., having a seed equivalent of 8,997,620 bu. of flaxseed. During the fiscal year ended June 30, 1913, the linseed oil imports consisted of 173,690 gal., or the seed equivalent of 69,476 bu. The marked decline in imports of oil during the past fiscal year may be attributed to the compensatory duty in the tariff act of 1922.

U. S. Production Increases

The 1923 flaxseed crop in the United States is officially estimated at 19,400,000 bu. in the September forecast. This is an increase of 7,732,000 bu., or 66 per cent over the 1922 crop, and will be the largest crop since 1912, when it was officially estimated at 28,073,000 bu. Prior to 1912 for a period of 13 years the estimated production varied from 12,718,000 to 29,285,000 bu., an annual average production of 23,105,692 bu. From 1913 to 1922 the estimated production varied from 7,256,000 to 17,853,000 bu., or an average annual production during that period of 12,022,000 bu.

Great Britain Striving to Develop Representative Chemical Industry

Notable Progress Made in Production of Fine Chemicals—Public Support an Aid in Development—Strong Competition Expected From America and Germany

By Paul Wooton
Washington Correspondent, *Chem. & Met.*

GREAT BRITAIN is determined to have a representative chemical industry. The public is displaying an interest and is backing up the effort to a degree not so much in evidence in the United States. Where formerly a place in the navy was sought for the boy who displayed the greatest intellectual promise, the tendency in the United Kingdom now is to place him in the chemical industry. It is regarded that there he has greater personal opportunities and is in a position to contribute most to the empire's defence.

Great importance is being attached to research. Substantial progress of a scientific character has been made in nearly every branch of the industry.

The best work since the war seems to have been done on fine chemicals, but this is probably due to the fact that the British were well advanced in the manufacture of heavy chemicals in 1914. Even in that line of endeavor, however, there were many gaps and much dependence on Germany. This was brought home very forcibly early in the war by the lack of facilities for the manufacture of fuming sulphuric acid—a situation which might well have been attended with serious consequences.

Public Is Behind the Industry

The British are demonstrating their temperamental fitness for chemical manufacture and the public is thoroughly convinced that the industry is essential to national vitality. Free-trade England has been willing to do much more for the safeguarding of its chemical industry than has the United States, which is normally protectionist.

The public sentiment behind the British chemical industry may be accounted for in part by the fact that manufacturing is the predominant activity of the British Isles. The sudden severance of trade with Germany at the outbreak of the war found so many plants in immediate danger of having to suspend production through the lack of some essential chemicals that it was brought home to all manufacturers that a certain amount of self-sufficiency is a wise precaution. Moreover, there is a very general realization that the chemical industries today offer the most promising field for large and profitable development.

While the British industry has enjoyed a greater measure of public support than has been the case in America, the industry here has had the advantage of a greater degree of confidence on the part of the bankers. New World bankers, accustomed as they are to support pioneering in one form or another, have given a much greater measure of support than did British bankers. There is very general resentment there because of the lack of co-operation on the part of the financial interests. During the critical times of the deflation period in 1921, the banks all but deserted the industry and even today they are pursuing a reactionary policy toward it. The industry has met this shortage of liquid assets by standing together unselfishly. There are many instances where a concern has helped a competitor through a financial emergency. As a result, there is a new spirit of internal confidence in one another and a sense of stability that might otherwise have been lacking. While the policy of the bankers has delayed the expansion of the industry, it certainly has increased its morale and its confidence in itself.

There is a feeling among British chemical manufacturers that they were deserted by their bankers at a very critical time in the development of their industry. Impressions of some of the leading men in the chemical industry in the United Kingdom are reflected in this article by Paul Wooton, the Washington correspondent of "Chem. & Met." Mr. Wooton has returned recently from a visit to England and France.

Sir William Alexander, the chairman of the British Dyestuffs Corporation, Ltd., who during the war was the General charged with the direction of the national explosives factories, told this correspondent that had the armistice been delayed even a week, bombs containing 1,000 lb. of TNT would have been dropped on Rhine cities. Since the next war will begin where the World War left off, there is no doubt in Great Britain that the next struggle will be largely a chemical one. The British do not expect to be found helpless if they are forced to participate in it.

The British industry does not expect to be safeguarded legislatively for an indefinite period. The manufacturers declare that they will not be satisfied with the protected home market. They have no ambitious dream of dominating the markets of the world. It is very apparent that they recognize that others will have a share in supplying the world's requirements. They expect powerful competition from America, but they are convinced that it will be a fair and friendly rivalry which will make for the advancement of the art and for the increase of the world's capacity to absorb chemical products.

German Competition Expected

The English expect Germany to come back into the market as a powerful competitor but with such loss of prestige that no chance exists for her to regain her former position. This prediction is based on the fact that Germany's trade was built on unsound foundations. The consumers of the world had been influenced by skillful propaganda to believe that German chemists had no equals and that Germany's manufacturing processes could not be duplicated. Then, too, the Germans held over the heads of consumers the fear that they might be denied new products if they traded elsewhere.

The consumers of the world now have learned that others can make as good dyes and other chemical products as can the Germans. They recognize that the extensive program of research going forward in the United States and in Great Britain is as likely to be productive of new products as are any efforts of the Germans.

In the matter of research, the British industry just has had something of a shock caused by the rather summary resignation of Dr. Arthur G. Green from the important post of director of research and chief chemist of the British Dyestuffs Corporation, Ltd. The trouble apparently was difference of view as to the amount of research that should be conducted. Under present conditions of demand, the directors of the corporation were not ready to accept Dr. Green's entire research program. A majority of the directors were willing to sacrifice some research at this time in favor of an effort to secure greater manufacturing and sales efficiency. There can be no question that British manufacturers have a correct appraisal of the value of research. Their ideas in that direction are more generous than are those of some large American interests. The differences with Dr. Green are not interpreted in England as an indication of any lack of faith in research as a major activity. The question involved was simply one of how far the corporation could afford to go at this particular time.

Va.-Carolina Co. Sells Holdings in American Cyanamid Co.

The Virginia-Carolina Chemical Co. has sold its common and preferred holdings of American Cyanamid Co. for a sum said to be between $1,500,000 and $2,000,000. It is understood that Benjamin N. Duke was the buyer.

The Virginia-Carolina Chemical Co. realized a large profit from the sale, which included approximately 15,000 shares of American Cyanamid common and several thousand shares of the preferred.

Washington News

Chemical Profession Following Trial Closely

Attitude Indicates Belief That Government's Case Is Poorly Taken in Suing Foundation

An opportunity having been offered to examine the government's voluminous brief filed in connection with its suit against the Chemical Foundation, a very general reaction among chemists is that the document contributes still further to the poor showing the Department of Justice has made. Moreover, many are wondering if any Judge would not be offended by the department's publicity methods.

No one familiar with the Chemical Foundation's case predicts a victory for the government. The tendency is to regard the whole procedure as an appalling waste of public money and the time of public officials, to say nothing of the waste of Foundation funds in having to defend the suit.

The brief is regarded as a further indication that the department is attempting to establish a theory of law, with little or no regard for evidence. It is pointed out that this theory of law the department is attempting to set up would so limit the President as to cripple the country in time of war. Many doubt that any Judge would render a decision condemning a President, during a period of national emergency, from delegating authority.

An interesting feature of the trial that just has come to light is that all of the chemists who testified for the Foundation did so voluntarily and without fee. The government, on the other hand, had great difficulty in securing its expert witnesses. Many chemists declined the invitation. This applies as well to government chemists who risked administration disfavor in declining to assist in supporting the government's case. This is regarded as an excellent indication of the attitude of the profession.

Production Costs of Amino Acids and Salts to Be Investigated

The Tariff Commission has ordered an investigation into costs of production of amino acids and salts and into rare sugars on the application of the Special Chemicals Co. of Highland Park, Ill., for an increase in the duties on these chemicals.

A preliminary hearing on these applications to determine whether they should be set for investigation under the flexible provisions of the tariff act was held Sept. 29. This is the first case in which the commission has conducted a preliminary hearing of this nature. The case for the applicant was presented by John Benson, vice-president of the company. No opposition was entered.

Amino acid and salts thereof are used principally at present in research work connected with the medical profession. Because of the possibilities believed to exist in this chemical and its derivatives, the War Department is said to be concerned in assurance of a permanent domestic production. Rare sugars are used in laboratory work, for bacteriological tests principally.

The principal competitor is Germany. The applicant asks imposition of American valuation on these chemicals, which would increase the duties approximately 100 per cent.

The Tariff Commission has fixed final hearings on applications for changes in duty on oxalic acid, Nov. 5; diethylbarbituric acid, Nov. 7; barium dioxide, Nov. 9; logwood extract, Nov. 12; and potassium chloride, Nov. 14.

Commerce Bureau Branch at Kobe

The Bureau of Foreign and Domestic Commerce has announced the establishment of a branch office at Kobe, Japan, in charge of Assistant Trade Commissioner Paul P. Steintorf. The activities of the Kobe branch are to be directed by the Tokio office of the bureau and will report all developments to Washington by cable.

Rubber Survey Progresses in Many Regions

The field investigation by the Department of Commerce into the possibilities of developing American controlled rubber plantations abroad is now fully under way. This field survey is being conducted by four parties of investigators, operating in the four major rubber-growing regions — namely, the Amazon region, the Far East, the Caribbean region and the Philippine Islands. Altogether there are over fifteen political units now being covered by the investigators, all of which territories are known to be potential fields for the cultivation of the para rubber tree.

Dr. William L. Schurz, United States commercial attaché to Brazil, has charge of the Amazon party which left Para on Aug. 13, 1923, to make surveys along the tributaries of the Amazon.

In the Far East David M. Figart, special agent of the Department of Commerce, who is well known in Far Eastern rubber circles, is making a very extensive survey of the existing plantation areas and costs.

The investigation in the Caribbean countries, including Mexico and the northern portions of Venezuela and Colombia, is under the direction of John C. Treadwell, a practical crude rubber expert and until recently vice-president of the Continental Rubber Co. of New York.

C. F. Vance is in charge of the expedition to investigate the possibilities of the Philippines.

In providing the personnel and in the assembling of data the department is enjoying the full co-operation of every important American rubber firm; those which at present own rubber plantations have even made their private records freely available upon request. The Rubber Association of America, Inc., and the National Automobile Chamber of Commerce have appointed advisory committees to assist whenever possible.

Spain Ready to Negotiate Tariff Treaty

Reports from Spain say that country is prepared to make a treaty with the United States on condition that the United States grants her concessions relative to the customs tariff touching upon Spanish products which form the bulk of Spanish exports to America. Among the commodities mentioned are oils, licorice root, rawhides, castile soap and corks. In the event these concessions are granted by the Washington Government Spain will give the United States all the advantages obtained by other countries in recently concluded treaties of commerce.

Short Weight Discovered in Reagent Chemicals

The Bureau of Standards has recently had occasion to check up weights of packages of reagent chemicals of the analyzed grade, and has found serious shortage of weight in many of the packages marked as containing 500 grams. The reagents in question were sodium potassium tartrate, potassium oxalate, anhydrous copper sulphate and dihydrogen ammonium phosphate, among others. In several cases the actual contained quantity was almost exactly a pound, roughly 450 grams, instead of the 500 as labeled. In another case as little as 431 grams was found. Such shortages of 10 and 15 per cent may have been only sporadic cases; but the bureau suggests that a large number of users should check up on the quantities obtained to see whether there has not been more or less widespread loose practice.

Seek Permanent Restraining Order Against Aluminum Co.

The Federal Trade Commission last Wednesday petitioned the Supreme Court for a permanent restraining order against the Aluminum Co. of America relative to the dissolution of two of its subsidiary companies. The case has been before the commission since March 9, 1921, when the commission issued a formal order against the company to divest itself of stock in the Aluminum Rolling Mills. The Aluminum Co. appealed the case to the Circuit Court and finally to the Supreme Court for a modification of the commission's order, but on both occasions the company's request was denied. The commission now is asking the Supreme Court to make its order permanent.

Chemical Foundation Declares Government's Charges Entirely False

Brief Filed Denies Daugherty's Accusation and Assails Him for Bringing Suit

ANSWERING the charges of the government as filed in the brief of its suit against the Chemical Foundation, a 538-page brief in defence has been entered by this corporation. Attorney-General Daugherty is attacked therein for the charges contained in his complaint, which are declared to be entirely unfounded and absolutely unjust. The equity suit for the return of the 4,800 alien patents seized and sold during the war and sold to the Foundation for $250,000 is about to reopen for the hearing of final arguments in the case and it is in preparation for this event, which is to take place on Oct. 8 at Wilmington, Del., that these briefs have been prepared. The arguments are expected to require a week and will be heard by Judge Hugh M. Morris, who presides in the court at Wilmington.

The brief filed by the Foundation is as thorough in its denial as was the government's in its charges. Every allegation of fraud and deception, and the alleged deception of Frank L. Polk especially, was denied. It pointed out that after Secretary Polk had been described in the complaint as having been deceived and defrauded, the government developed an unwillingness to elicit his testimony after calling him to the stand and finally was compelled to hear him "repudiate every suggestion that he had been deceived by anybody about anything in the whole transaction." The brief went on:

Wilson Not in Ignorance

"Equally preposterous has the trial disclosed to be the charge that the President was deceived and defrauded. The President acted with full knowledge in all he did in this matter. The bill is singularly indefinite. Who deceived the President and Mr. Polk is nowhere disclosed. Who the alleged conspirators were is nowhere set forth definitely and specifically; and the long trial has not yet cleared up this strange mystery; the charges remain as nebulous as at the beginning."

The brief went on to say that the government maintained that consideration of the future welfare of the United States and its national defence had no place in the matter, "even though the independence of the United States were at stake, and that if the Custodian considered this at all in selling enemy-owned property he was acting illegally. The defendant's position, on the other hand, was equally clear that these considerations were paramount."

The brief argued that "the courts have no jurisdiction to review the determination of the President; that it was in the public interest that particular enemy-owned property should be disposed of otherwise than at public sale to the highest bidder, on the terms and conditions of the disposition directed by him."

Sale Open and Price Adequate

This was in reply to the complaint that the sale was private. The defence maintained that a public sale to the highest bidder might have eventuated in the resale of the patents to the Germans.

Opposing the government's charge that the $250,000 sales price was inadequate, the brief pointed out testimony showing that the lack of essential data in the German patents, the required expenditure of large funds and much time in supplying the missing data, and the chartered compulsion on the Foundation to issue licenses to all American applicants and to restrict its profits to 6 per cent. This, it claimed, made the price abundantly sufficient.

The legal fray which will mark the end of the trial of the government's suit against the Chemical Foundation in the Federal District Court is scheduled to take place this week at Wilmington, Del. Both sides have prepared an ample supply of ammunition. The government accuses the Foundation of fraud, deceit, unlawful confiscation, conspiracy and various other sundry illegal proceedings. The Foundation, on the other hand, not only denies in most emphatic language these various charges but demands retraction and open acknowledgment of the harm done by dragging the corporation into such a trial. Since the outcome of the trial is of far more than passing concern to the chemical industry, the decision to be handed down by Judge Morris is awaited with keen interest.

After touching every phase of the case, the brief concludes: "The burden of the trial has wrought great, indeed immeasurable, harm to the defendant. Large sums of money which should have gone toward the fulfillment of its trust have been diverted to the necessities of its defence and the defence of the new American organic chemical industry. Its good name has been ruthlessly assailed. The confidence of the public in its patriotic and unselfish purposes has been impaired. In all this the only gainer has been the erstwhile enemy.

"It is earnestly submitted, therefore, that the defendant is entitled to more than the mere dismissal of the bill of complaint. It is certainly entitled to a distinct declaration of its innocence and loyalty in all its acts, and not merely a Scotch verdict. It is also entitled to have that branch of the government whose sole concern is with the impartial administration of justice undo its wrongs which another branch of the government has unwarrantly inflicted upon it.

"The defendant therefore earnestly prays a complete and unqualified vindication at the hands of the court and the dismissal of the bill on the merits in all its aspects."

The brief was submitted by William D. Guthrie, Isidore J. Kresel, William G. Mehaffy, Bernard Hershkopf, Lucien H. Boggs and Seiforde M. Stellwagon, counsel for the defence.

Exposition Plans for 1925 Already Being Made

As the 1923 Chemical Exposition closed at the Grand Central Palace plans for the 1925 exposition were already under way. At a meeting of exhibitors, the advisory committee and management on Sept. 20, preliminary arrangements for 1925 were made. The week of Sept. 28, to Oct. 3, 1925, and the Grand Central Palace, New York, were the time and place finally decided upon. Announcement was made at the close of the exposition on Sept. 22 that more than 75 per cent of space on the first floor had already been contracted for in the 1925 exposition by present exhibitors. Broad changes and new developments for 1925 are already being considered in the formulation of early plans.

National Safety Congress Held at Buffalo

Many topics of considerable concern to the chemical engineering industries were discussed before the twelfth annual safety congress of the National Safety Council, held at Buffalo, N. Y., from Oct. 1 to 5. While the hazards in practically every branch of industry received some measure of attention, the joint meeting of the rubber with the chemical section, the independent meetings of these sections as well as those dealing with cement, engineering in general, metals, packers and tanners, paper and pulp, produced valuable discussion. Among the topics of especial interest were the following: Benzol poisoning, safe handling of solvents, elimination of occupational diseases in the chemical and rubber industries, round table on chemical burns, demonstration and discussion of safety devices for use in handling chemicals, powdered coal hazards, pressure vessels, some of the new industrial poisons, handling material in the foundry, safety in the paper industry, acetylene welding and safety in oil plants, elimination of hazards in byproduct plants, safety devices for mills and colanders, fire prevention in spreader houses.

A report of this meeting will appear in next week's *Chem. & Met.*

Chemical Industry Growing at Niagara Falls

Paper, Abrasives, Nitrogen Products to Be Produced on Larger Scale—Much Plant Expansion Noted

Chemical and affiliated plants at Niagara Falls and Tonawanda, N. Y., have commenced work on expansion and new building programs to provide for considerable increase in production. A new company, known as the Niagara Ammonia Co., has acquired the former plant of the Hydro-Fats Co., Buffalo and Columbus Aves., Niagara Falls, adjoining the works of the Hooker Electrochemical Co., for the establishment of a new plant for the manufacture of ammonia and kindred products; alterations and improvements will be made, including the installation of additional equipment, and operations commenced at an early date.

The Union Carbide Co., Union St., Niagara Falls, has completed plans and will soon commence the erection of a new addition to its plant, 75x160 ft., of same type as present construction. It will be used for increased production. The General Abrasive Co., College Ave., Niagara Falls, has work in progress on a new building at its plant, to be used for general operating and storage service. The company has recently completed the erection of a new office. The International Paper Co., Buffalo Ave., Niagara Falls, is completing plans for the erection of a new steam power house at its plant, estimated to cost about $210,000 with equipment.

At North Tonawanda, the Ontario Paper Co., Thorold, Ont., has commenced work on its proposed new paper mill, to be operated in the name of the Daily Newsprint Corporation, a subsidiary. The site is on Little Island, with adjoining property available for future expansion. The initial works will consist of a main machine department, 95x380 ft.; beater department, 130x145 ft.; and main operating mill, 150x400 ft. Other structures will include a power house, machine shop and different mechanical departments. The new plant will specialize in the production of newsprint papers, and will cost in excess of $2,500,000, with machinery. It is expected to have the first unit ready for service early next spring. Warren Curtis is general manager.

Washington Steel Treaters Begin 1923-24 Season

The first meeting of the 1923-24 season of the Washington Chapter of the American Society for Steel Treating was held on Friday, Sept. 28, at 8 p.m. in the auditorium of the Interior Department Building. A general discussion of several metallurgical topics was arranged in which illustrated presentations of the following subjects were made by the following members: Protective Coatings for Selective Case-Hardening, J. S. Vanick; Heat-Treatment of High-Speed Steel, H. J. French; and Continuous Heat-Treatment, W. F. Graham.

Financial Notes

The Pennsylvania Salt Mfg. Co. for the year ended June 30, 1923, reports surplus of $1,303,236 after taxes and deduction of $731,346 for repairs and replacements. This is equal to $8.68 a share earned on $7,500,000 capital stock. Surplus in the previous year was $935,-188, or $6.23 a share.

The By-Products Coke Corp. showed an increase in earnings for the first half of the year. It is still uncertain whether dividends on the common stock will be resumed this year.

The Eagle-Picher Lead Co. has declared a stock dividend of 11 1/9 per cent, an extra cash dividend of $1 and a regular quarterly dividend of $1.25. All are payable to stock of record Oct. 2. Distribution of stock dividends calls for the issue of $2,000,000 additional stock, bringing the total outstanding to $20,000,000.

The Amoskeag Mfg. Co. statement for the year ended June 2 shows a loss of $75,483. For the previous year the company reported a profit of $648,087. The deficit, after preferred dividends, amounted to $2,080,683, compared with a deficit of $1,875,513 for the year previous. The total sales for the year are given at $22,162,477, compared with $24,838,805 for the year ended May 28, 1922.

The American Glue Co. has declared a regular quarterly dividend of $2 a share on preferred stock.

The Corn Products Refining Co. has declared an extra dividend of ¾ per cent on the common stock, in addition to the regular quarterly dividend of 1¼ per cent.

Hoover Organizes Relief for Standards Bureau Victims

Quick work has been done in commencing the collection and disbursement of funds for the families of the employees who were killed at the Bureau of Standards on Sept. 20. The men who died were performing a dangerous experiment in a research on motor fuels.

Secretary Hoover immediately appointed a committee for organization of relief consisting of Dr. George K. Burgess, chairman; Dr. F. C. Brown, H. D. Hubbard and E. W. Libbey. The American Petroleum Institute, which was cooperating in the research, has given $10,000, Secretary Hoover $1,000, and numerous other individual organizations have expressed a desire to share in the relief of those financially affected by the accident. Any who desire to contribute to this fund should address the committee, care of the office of the Secretary of Commerce.

Non-Corrosive Solution Excites Interest

To Be Manufactured on Semi-Commercial Scale by S. A. Day Co., of Buffalo, N. Y.

In the presence of representatives of the Buffalo General Electric Co., the D. L. & W. R.R. Co. and the Semet-Solvay Co., at the plant of the latter company on River Road, Buffalo, final tests were recently made of a non-corrosive solution that is expected to be of immense value in reducing loss by corrosion in steel plants, foundries, chemical plants and the like.

The product is covered by a British patent. It has been put through all kinds of tests, especially those calculated to show resistance to acids, alkalis and sudden changes of temperature. The solution, it is claimed, will cover 25 per cent more surface than paint and has protective qualities under conditions where paint would not last at all. It will also remove rust from iron and steel. The cost is said to be much cheaper than the application of red lead and graphite.

The S. A. Day Co., 1485 Niagara St., Buffalo, will manufacture the product in an experimental manner until it has proved a commercial success. Carl P. Martzloff, vice-president of the S. A. Day Co., who is associated with his father in the purchase of the American rights to the product, will superintend manufacture. Production at the end of six months will reach 1,000 gal. daily, it is expected.

American Welders to Meet at Pittsburgh

Three busy days with a wide variety of scheduled events are planned for the fall meeting of the American Welding Society. This meeting is to be held at Pittsburgh, Pa., Oct. 24 to 26, 1923, with headquarters at the Fort Pitt Hotel.

On Wednesday, the opening day, there will be a general session in the morning and an afternoon of technical work. The evening is to be spent at a banquet and general get-together. Thursday morning will be spent in consideration of arc welding problems, including arc welding of non-ferrous metals, structural steel and thin sheet metal, speed and cost of welding and standards of arc-welding apparatus. In the afternoon the Westinghouse plant is to be visited, and in the evening the society will be entertained by the Pittsburgh Railway Club.

Friday is to be a very full day, with the gas welding committee holding the floor in the morning. An inspection trip through the Carnegie steel plant will follow and in the afternoon a meeting of the committee on the training of operators is scheduled. In the evening A. D. Risteen, Travelers Insurance Co., will discuss "Welding and Insurance," to be followed by a talk on "The Railroad Situation" by George D. Ogden of the Pennsylvania System.

News Notes

Sugar beet plants throughout Colorado have advanced production to a 24-hour working day basis, and will continue on this schedule for the next 2 or 3 months. Production of the present crop is estimated at 5,000,000 bags, or approximately one-third increase over last year.

The Notre Dame Herring Oil Co. has recently been formed to extract the oil from herring and process the residue for conversion into fish meal and fertilizer. It is capitalized at $100,000, and will be established at Twillingate, N.S., which is a herring center. The plant will cost $55,000 and will manufacture between 70,000 and 100,000 bbl. of herring oil yearly.

The Delaware Section of the American Chemical Society held its first meeting of the season in the banquet room of the Lambros Restaurant, Wilmington, on Wednesday evening, Sept. 26, the session being preceded by an informal dinner at 6:30 o'clock. The principal address of the gathering was made by Dr. Graham Edgar, professor of chemistry at the University of Virginia, on the subject of "Atomic Weights and Isotopes," covering the theory of isotopes, the separation of isotopes and the problem of atomic decomposition.

From the bitumen extracted from its tar sand properties near Fort McMurray on the Athabasca River, the McMurray Asphaltum & Oil Co. is manufacturing a paint that is particularly suitable for protecting iron and steel from rust. It is to be used to paint a gas pipe line now being laid from the Viking field to Edmonton, Alta.

Nearly $17,000,000 is being asked from Germany by the Dominion Steel Corporation and six of its subsidiaries, and the Nova Scotia Steel & Coal Co., to cover losses sustained owing to operations during the World War. Torpedoed vessels under charter, chartered vessels requisitioned and costs of substituting requisitioned vessels are headings under which the claims are listed.

The University of Buffalo, Buffalo, N. Y., has arranged two practical courses in chemistry for the forthcoming season, adaptable to the needs of purchasing agents, salesmen, foremen and others in local affiliated industries. The classes will be held on two evenings of each week, one devoted to each course, both in charge of David E. Waite, assistant professor of chemistry at the institution. The first will cover the study of "Industrial Metals and Alloys," and the other "Materials and Strength."

The Mosaic Tile Co., Zanesville, Ohio, has commenced operations in a new type of kiln recently installed at its plant for the firing of bisque ware. The unit is known as the Marlow open-fire tunnel kiln, and is the first of its kind to be constructed in this country. J. H. Marlow is the patentee of the kiln and was present at the initial lighting.

Prize essay contest arrangements being conducted by the American Chemical Society with the fund made available for that purpose by Mr. and Mrs. Francis P. Garvan are progressing rapidly. A pamphlet has been printed setting forth the conditions of the contest and is being distributed widely. It is planned to invite several of the best known men in America to act as judges.

Twenty leaders in the American pulp and paper industry have recently been asked by the Secretary of Agriculture to form an advisory committee to work with the Department of Agriculture in formulating and carrying out its forestry policies which relate to the supply and use of timber in making paper and kindred products.

September Imports of German Dyes

Imports for consumption, through the port of New York, September, 1923, of dyes, color lakes, synthetic aromatic chemicals, medicinals, pharmaceuticals and other coal-tar products in paragraphs 27 and 28.

The imports of coal-tar dyes for September totaled 124,665 lb., with an invoice value of $128,544. The following table shows the monthly imports through the port of New York for the year 1923:

Month	Lb.	Value
January*	179,309	$185,344
February	191,709	199,690
March	312 809	301,436
April	242,022	256,751
May	261,869	292,340
June	247,174	257,803
July	144,687	142,428
August	178,164	194,164
September	124,665	128,544

*Not complete.

The five dyes leading in quantity imported were Gallamine blue, Trisulphon brown GG, Diaminogene blue, Phosphine and Xylene light yellow. Of the total quantity imported in September, 1923, 44 per cent came from Germany, 36 per cent from Switzerland, 14 per cent from Italy, 4 per cent from France, and 2 per cent from other countries.

The dyes in this report are grouped by Schultz numbers, and in the case of those which could not be identified by Schults number, the classification according to ordinary method of application was adopted. As the pastes and powders of the vat dyes vary widely in strength and quantity, each vat dye has been reduced to a single strength basis.

The imports of color lakes for September totaled 1,010 lb., with an invoice value of $446. The imports of synthetic organic chemicals for September totaled 5,530 lb., with an invoice value $11,692, and the imports of medicinals, photographic developers and other coal-tar chemicals totaled 10,003 lb., with an invoice value of $5,835.

Trade Notes

Exports of quebracho extract from the Argentine from Jan. 1 to Sept. 20 were 137,000 tons, as compared with 118,000 tons for the corresponding period of 1922.

The Keystone Rubber Manufacturing Co., a corporation of Erie, Pa., has filed a voluntary petition in bankruptcy in the U. S. District Court in Pittsburgh. Liabilities are placed at $258,-212 and assests at $138,504.

Dr. G. M. Mortati of the Superfos Co. has sailed for Europe. While abroad he will visit the Italian branches of his company.

Frank Kay has resigned as secretary-treasurer of the Emerson Chemical Corp. and has organized his own company under the name of the Barclay Chemical Corp., with offices and warehouse at 154 Chambers St., New York. Associated with him will be S. L. Gelb, formerly with George F. Taylor & Co.

Alpin I. Dunn, formerly treasurer of the Cook & Swan Co., has joined the staff of the National Oil Products Co., Harrison, N. J., to manage the crude oil department.

The Kentucky Color & Chemical Co. of Kentucky has designated R. G. Jackson, 23 Flatbush Ave., Brooklyn, as representative of the company for the State of New York.

Declared exports of quicksilver from the Madrid consular district to the United States for the first 5 months of 1923 amounted to 548,814 lb., worth $356,718. There were no exports during June.

The Treasury Department has granted a drawback allowance on egg products produced by the International Co., Baltimore, with the use of dried egg albumen and egg yolk.

Exports of manganese ore from Brazil in June were 38,994 metric tons. Of this 36,900 tons was shipped to the United States, and the remainder went to Belgium and France.

The annual meeting of the New York Color & Chemical Co. will be held on Oct. 9 at the office of the company, 12 Gold St., New York.

Charles F. Adams, Frank P. Carpenter, F. C. Dumaine and A. W. Sulloway have been re-elected trustees for the Amoskeag Mfg. Co. for a term of 3 years.

F. S. Dickson of Washington, who for the last several months has been assistant secretary of the Synthetic Organic Chemical Manufacturers' Association, has submitted his resignation to take effect Nov. 1 and will enter private business. Mr. Dickson formerly was in charge of the Dye and Chemical Control Board, during the period of control of imports by licenses, and previously was connected with the War Trade Board.

Market Conditions

Consumers Extend Operations in Chemical to Cover Later Deliveries

Contract Business Becomes More Active—Spot Trading Gains in Volume—Selling Pressure Causes Some Price Declines

IMPROVED buying of chemicals was reported during the week and in many cases there was more of a willingness on the part of consumers to place contracts involving deliveries for considerable periods ahead. The establishment of contract prices on caustic soda and soda ash has brought out business in these materials for long term periods. Bichromate of soda also is reported to have sold freely in future positions, although demand for the latter was stimulated by keen competition which resulted in price declines. Considerable interest in contracts for arsenic has been in evidence, but producers are not offering freely and prices quoted for foreign makes have been too high to encourage trading.

Call for chemicals for spot and prompt is gaining in volume but does not extend throughout the list, as some chemicals are not moving so freely now as they were a few weeks ago. This slowing up in demand refers mainly to chemicals for which there is a seasonal demand. In connection with the present buying movement it is stated that certain large consuming trades are buying in a larger way than was the case in the summer period, but are restricting purchases because they are carrying larger stocks of manufactured products than is usual at this time of year.

The weighted index for the week shows a rather sharp falling off, with some important allied products adding to the weakness caused by declines in the purely chemical products. The weighted index number is higher than the average for October in the two preceding years and in spite of price reductions last week there does not appear to be any general belief that market values are turning downward.

Prices for many important chemicals are established on a steady basis, but among the miscellaneous items there were several price declines during the week. Cream of tartar and tartaric acid weakened under slower demand and lower prices for imported grades. Domestic copper sulphate eased partly under the influence of the metal market and partly because of foreign competition. Oxalic acid and caustic potash likewise were lower in price in order to meet competition of importers. The arsenic market is holding attention because of the firmness with which this material is held. Domestic producers have offered contracts to consumers, but at present some producers have withdrawn prices and others are restricted. Foreign grades of arsenic also are strong in price with very little offered.

Competition Unsettles Bichromate Prices — Arsenic Firmly Held—Cream of Tartar Declines—Tartaric Acid Lowered —Domestic Copper Sulphate Reduced in Price — Imported Prussiate of Soda Easy—Export Inquiry for Caustic Soda—Oxalic Acid Dull and Weak.

Developments in the Ruhr are awaited, but so far nothing has come to hand to indicate any change in German chemicals and political dissensions in that country are proving a bar to industrial development.

Acids

Boric Acid—Some improvement is reported in the movement of this acid since the price was lowered, but new business is not running to large lots. Sellers are offering freely and consumers are not inclined to contract ahead while advances in price are regarded as improbable. Quotations are 9½@10c. per lb. in sacks, 10@10½c. per lb. in bbl., and 10½@11c. per lb. in kegs.

Lactic Acid—Some reports credit a marked improvement in demand and in practically all quarters it is stated that the market is looking up. Prices have been steadied by the greater demand and are quoted as firm at 4½@5c. per lb. for 22 per cent dark, 5½@6c. per lb. for 22 per cent light; 9½@10c. per lb. for 44 per cent dark and 11½@12c. per lb. for 44 per cent light.

Muriatic Acid—Outside of a larger distribution to consumers there is nothing new in the market. Holdings are large and sellers are in a position to take care of a big increase in consumption should the latter arise. No change has been made in quoted prices, which are 90c.@$1 per 100 lb. for 18 deg., $1@$1.10 per 100 lb. for 20 deg., and $1.75@$2 per 100 lb. for 22 deg.

Nitric Acid—Producers are carrying large stocks and have been eager to reduce them. Buying has reached larger volumes, but is still somewhat backward for this time of year. As a result the market is under some pressure and prices are none too steady, with consumers in a position of advantage. Open quotations are $4.50@$5 per 100 lb. for 36 deg., $4.75@$5.25 per 100 lb. for 38 deg., $5@$5.50 per 100 lb. for 40 deg., and $5.25@$5.75 per 100 lb. for 42 deg.

Oxalic Acid—Recent shading of prices has given an easy appearance to the market and offerings of imported acid are reported to be still available at private terms under 12c. per lb., although the latter figure is generally held as the inside quotation of sellers. Domestic acid has been reduced to 11¾c. per lb. at works.

Sulphuric Acid—Moderate improvement was reported during the week, but some of the large consumers have not yet become active and unsold stocks are large enough to hold the market in an easy position. This is evident from reports that business has gone through under the quoted levels of $9@$10 per ton for 60 deg. acid in tanks and $15@$16 per ton for 66 deg. Oleum is holding a fairly steady position with no weight of offerings to depress values. Asking prices are $18.50@$20 per ton at point of production.

Tartaric Acid—Buying has been of small proportions and values have eased off for all selections. Imported tartaric was subject to private negotiation, with values given at 32@32½c. per lb. Domestic acid, which had been held at 36c. per lb., was marked down to 34½c. per lb. Even at the lower price levels there was very little interest shown by buyers and small lot orders formed the greater part of trading.

Potashes

Bichromate of Potash — There has been little change in the market. Prices have been easy in recent weeks and this condition still exists. Buying orders have not been reaching the market in a large way and there is enough competition to hold values in an uncertain position. Open quotations of 9¾c. per lb. are given by some sellers, but 9½c per lb. can be done and even the latter figure is not regarded as very firm.

Caustic Potash — Offerings of imported grades were on the market at unchanged levels. Spot material is

offered at 7@7¼c. per lb., with only a moderate buying interest. Shipments were quoted at 7c. per lb., with importers awaiting developments in foreign markets. Domestic caustic, which had been held at 9c. per lb. at works, at length felt the effects of foreign competition and was offered at 7c. per lb. at works.

Chlorate of Potash — Stocks of imported chlorate are kept at low levels by the fact that consumers are giving the preference to the imported material because of price differentials. Production of chlorate in this country has been curtailed because of the competition from foreign-made material. Prices are quoted at 7½@7¾c. per lb. for foreign and 8½c. per lb. at works for domestic.

Permanganate of Potash—Firmness in price has been followed by improvement in demand and a little better inquiry was reported. Prices are growing firmer on spot according as stocks are growing less. Asking prices last week were 18c. per lb. and even up to 18½c. per lb. It is said that odd lots were to be picked up at 17½c. per lb. but the movement of prices was upward and this is bringing shipment values into line.

Prussiate of Potash—While there is no inquiry at present for prussiate the tone of the market was steady and holders of stocks were not cutting prices in order to attract buyers. Yellow prussiate on spot ranged in price according to seller from 29c. to 31c. per lb. For shipment 28@30c. per lb. was asked. Red prussiate is quiet, with quotations holding at 60@62c. per lb.

Sodas

Soda Ash—While there are reports that some consuming trades are not taking deliveries of normal amounts, the total movement from works is said to be up to normal standards and the market for ash is regarded as satisfactory. Prices are well established and resale material on spot was described as firmer last week. Contract prices on light ash hold at $1.33 per 100 lb. in bulk, $1.45 per 100 lb. in bags, and $1.69 per 100 lb. in bbl. Dense ash on contract is held at $1.42 per 100 lb. in bulk, $1.51 per 100 lb. in bags, and $1.75 per 100 lb. in bbl.

Bichromate of Soda—More than usual attention has been turned towards this chemical because of activity on the part of sellers. Some producers started to take on contracts and offered 1924 deliveries at private terms. This brought other producers to the point of quoting on forward positions and price declines by one producer were met or bettered by others, with the consumers getting the benefit of a miniature trade war. There were open offers of contracts at 7¼c. per lb., then at 7c. per lb. and according to reports business was done under the 7c. level. The market is still irregular and prices are largely subject to private terms, although the lower prices have applied only where producers were dealing direct with consumers. Some sellers in the open market were asking 7½@7⅝c. per lb. and this quotation applied to fair sized lots for the jobbing trade.

"Chem. & Met." Weighted Index of Chemical Prices

Base = for 1913-14

This week	165.27
Last week	172.50
Oct., 1922	152.00
Oct., 1921	151.00
Oct., 1920	263.00
Oct., 1919	233.00
Oct., 1918	280.00

Downward revision in prices for crude cottonseed oil, methanol, copper sulphate and caustic potash (domestic) account for the drop of 7.23 points in the weekly index number.

Caustic Soda—Improved inquiry for export was reported, but bid prices are frequently too low to admit of acceptance. It is stated that considerable amounts of outside brands have sold recently for export. Asking prices for the latter are now $3.05 per 100 lb. with standard brands at $3.10 per 100 lb. Some inquiry for 1924 contracts is reported to be coming from domestic consumers and there is a good call for deliveries against current contracts. Contract prices hold at $3.16 per 100 lb. at works.

Cyanide of Soda—Fairly good call for supplies is reported both for home and for export. Market prices show considerable range according to grade and seller. Asking prices run from 19c. to 23c. per lb. Standard domestic cyanide is holding steady around 22c. per lb.

Nitrate of Soda—Recent reports from Chile state that sales of nitrate from the beginning of the current nitrate year on July 1 were approximately 1,200,000 tons. This is about one-half the total sales estimated for the entire nitrate year and is more than 300,000 tons greater than the sales for the corresponding period of the last nitrate year. It is further stated that the Nitrate Association has sold its entire quota for the first half of December. While trading is not active in domestic markets, the tone has been firmer and price cutting, which was a feature a short time ago, has now disappeared and spot material is steady at $2.45 per 100 lb. Refined nitrate also is holding steady in price at 4@4¼c. per lb. for granulated, 5@5¼c. per lb. for crystals, and 5¼@5½c. per lb. for powdered.

Prussiate of Soda — Prussiates are said to be finding difficulty in securing normal consumption in some industries because of lower prices for other materials. At any rate the prussiate market is quiet at present. Improved grades are easing off as holders try to stimulate buying. Spot offerings of imported were available at 13½@13¾c. per lb. Domestic material is said to be about as low in price as it can go without selling below cost and is holding at 14c. per lb.

Miscellaneous Chemicals

Arsenic—Occasionally an odd lot of white arsenic appears in the spot market around 11¾c. per lb. but in general the market is strong with 12c. to 12½c. per lb. representing the asking prices. Considerable interest is taken in spot and prompt, but actual buying is said to be light. Contracts are still in a firm position and the fact that foreign grades are held at 12@12½c. per lb. with no pressure on the part of sellers has created uncertainty about the supply from abroad. Domestic arsenic has sold on contracts direct to consumers, but some producers are now out of the market and others were quoting 11c. per lb. delivered over the balance of the year.

Bleaching Powder — Considerable comment has been aroused by announcement of a decline in contract price for delivery over the last quarter of the year. This decline as made by one producer names $1.65 per 100 lb. as the carload price. Some buyers say it is possible that prices may work into a firm position, but at present values are depressed due to what practically amounted to overproduction in the earlier months of the year. Prices for prompt and nearby deliveries are not stable and private terms are expected to rule until holdings have been reduced.

Copper Sulphate—Weakness in the metal market, slowing up in consuming demand, and possibly desire to take on further business, caused prices for domestic sulphate to ease off and offerings were on the market at 4.90@5c. per lb. with freight allowed. Foreign grades are dull and easy with spot easy at 4¾c. per lb. and shipments around 4½c. per lb. A report from Italy states that considerable amounts of copper for sulphate manufacture have been bought and this is taken as an index of continued competition from Italian makers.

Pyrites—Buying has not been active owing to competition from sulphur manufacturers. Prices for pyrites are given as: Imported lump, 1 in. diameter and up, 11½c. per long ton unit; furnace size, 2½ in. diameter, 12c. per long ton unit; fines, through ½-in. mesh, 11½c. per long ton unit; cinder property of buyer, ex ship, Atlantic ports. Ore contains 50@51 per cent sulphur; cinder about 63 per cent iron.

Magnesite—There is a good business passing in all grades of magnesite. Sellers quote crude magnesite, $14 per ton; calcined, $35@$37, f.o.b. shipping point in California. Dead-burned magnesite in sacks, $40@$42, Chester, Pa.; in bulk, $32@$34, Chewelah, Wash. Caustic calcined, Grecian, $50@$51, c.i.f. New York.

Cream of Tartar—Imported grades have been offered at relatively low prices, with quotations at 24½c. per lb. Domestic grades were easy as a result of slow consuming demand and keen competition from the foreign product and makers announced a decline of ½c. per lb. to 25½c. per lb.

Coal-Tar Products

Buying Interest in Benzene for Shipment—U.S.P. Phenol Barely Steady—Naphthalene Unsettled

BASED on the assumption that inquiries now in the market for 90 per cent benzene for forward delivery should result in business, producers were inclined to take a more optimistic view of the situation. No price revisions were reported. Scattered parcels of 90 per cent benzene for prompt shipment could have been secured at concessions from the "open" trading basis, but first hands were unwilling to meet buyers' views on forward contracts. Moderate improvement was reported in export inquiry. The situation in U.S.P. phenol showed favored buyers. Offerings of spot material are increasing and in more than one quarter supplies could have been obtained for less than 28c. per lb. Futures were wholly nominal. Naphthalene was irregular. Producers of flake, who contracted for crude when the market was higher, were largely responsible for trying to maintain prices around the 7c. basis. Intermediate makers have been absorbing crude and chips in a larger way. Foreign markets were easier, advices from Manchester quoting £6 per ton on the lower grades of naphthalene, with higher quality material bringing from £8@£12 per ton, ex-works.

Salicylates were quiet and featureless. With no important change in phenol, manufacturers of salicylates believe that prices for their products will hold on a fairly steady basis for some time.

Offerings of solvent naphtha were moderate, production in most instances being well sold up. Pyridine was offered for shipment from abroad, but prices asked were high. The week witnessed heavy importations of aniline colors.

Alpha-Naphthylamine—Demand was described as routine only, but no selling pressure developed and producers generally quote from 35@36c. per lb., as to quantity, immediate shipment.

Aniline Oil and Salt—There were offerings of aniline oil at 16c. per lb., carload basis, prompt shipment from works. The market was steady, with demand showing some improvement. On salt prices heard were unchanged at 22@24c. per lb., as to quantity and seller.

Beta-Naphthol — Competition among producers was keen and prices were barely steady, ranging from 21@23c. per lb. for immediate shipment from works.

Benzene—The market for 90 per cent material was a spotty affair. Leading producers regarded the outlook as more promising. Inquiry was in evidence for forward contracts and the views of buyers and sellers are gradually coming together. Export call was more frequent and some business went through in the 90 per cent grade around 22c. per gal., bulk basis. Generally, the market for 90 per cent benzene held at 25c. per gal., tank cars, f.o.b. works, with the pure at 27c. per gal.

Creosote—English makers quote the market as nominally unchanged at 8¼@ 8½d. per gal., ex-plant. Demand abroad has been fair.

Cresylic Acid — Importations continue at a fair rate, and with domestic production larger than it has been, competition for business tends to unsettle prices. Quotations on 95@97 per cent material range from 70@85c. per gal., as to delivery, seller, etc. It was reported that good quality 95 per cent acid could be secured for shipment at less than 70c. per gal.

Naphthalene—Trading was inactive so far as the flake was concerned. Contracting for future requirements will take on larger proportions from now on. Nominally the market for white flake held at 6½@7c. per lb. Intermediate makers showed more interest in crude, as well as chips. Foreign markets for crude were easier.

Phenol — Spot offerings of U.S.P. phenol were numerous and prices were unsettled where round lots were involved. Most traders refused to buy except in a hand-to-mouth way. The market on nearby material closed at 25@28c. per lb., as to quantity and seller. On distant deliveries it was reported that 25c. could have been shaded.

Pyridine—The market was wholly nominal because of the dearth in offerings. Forward shipment from abroad was offered in a limited way at $4.50@ $4.75 per gal., as to quantity and seller.

Salicylic Acid—First hands quote the market as unchanged at 35c. per lb., U.S.P. quality, and 30c. per lb., in the technical. Demand has been slow, but no particular selling pressure developed.

Solvent Naphtha—Production is well taken care of by existing contracts and the market presented a firm undertone. The water-white, in tanks, f.o.b. works, held around 27c. per gal.

Will Revive Potash Production in Russia

The repair of the Kuban potash factories is being taken energetically in hand. The production of potash at one time was a leading branch of industry in the southeast of Russia, and was mainly concentrated in Kuban, where the potash produced acquired a reputation equal to that of foreign production. It contains up to 92 per cent of salt, while the level of the foreign product is only 87 per cent.

Alcohol

There was a steady market for all grades of denatured alcohol, but closing prices revealed no changes. Demand was up to normal for this season of the year. Formula No. 1 was offered by leading producers on the carload basis of 41c. per gal., in drums, and 47c. per gal., in bbl. Special 190 proof held at 40c. per gal., in drums. Ethyl spirits were quotably unchanged at $4.75@ $4.80 per gal., 190 proof, U.S.P., round-lot basis. Irregular prices were heard of in the market for methanol and the list shows a lower range. The 95 per cent grade was offered at 98c.@$1 per gal., in bbl., with the 97 per cent grade at $1@$1.02 per gal., carload lots. Pure methanol was offered at $1@$1.10 per gal.

Find Lime Freight Rate High

Freight rates on lime in carloads from the various Missouri kilns of the Glencoe Lime & Cement Co. to points east of the Indiana-Illinois state line have been found unreasonable and unduly prejudicial by the Interstate Commerce Commission.

Latest Quotations on Industrial Stocks

	Last Week	This Week
Air Reduction	64	64½
Allied Chem. & Dye	64	64¾
Allied Chem. & Dye pfd	107	106½
Am. Ag. Chem.	13¼	13½
Am. Ag. Chem. pfd	36¾	35½
American Cotton Oil	7	6½
American Cotton Oil pfd	21	19
American Cyanamid	*69	*75
Am. Drug Synd.	5½	6
Am. Linseed Co.	16½	17
Am. Linseed pfd.	*38	*38
Am. Smelting & Refining Co.	56¾	58½
Am. Smelting & Refining pfd.	96	96½
Archer-Daniels Mid. Co., w.i.	26½	27
Archer-Daniels Mid. Co., pfd.	92	90
Atlas Powder	54½	53¾
Casein Co. of Am.	*62	*63
Certain-Teed Products	32	*27
Commercial Solvents "A"	*32½	27
Corn Products	125¾	127¼
Corn Products pfd.	119	120
Davison Chem.	41¾	47¾
Dow Chem. Co.	*45	*47
Du Pont de Nemours	123¾	129
Du Pont de Nemours db.	85	86½
Freeport-Texas Sulphur	12	12¾
Glidden Co.	6¼	7
Grasselli Chem.	*132	*132
Grasselli Chem. pfd.	*105	*105
Hercules Powder	110	107
Hercules Powder pfd.	107	105
Heyden Chem.	1¼	*1¼
Int'l Ag. Chem. Co.	1¼	*2
Int'l Ag. Chem. pfd.	5½	7
Int'l Nickel	12¼	12¼
Int'l Nickel pfd.	77¼	78
Int'l Salt	*89	*89½
Mathieson Alkali	37½	37½
Merck & Co.	*80	*80
National Lead	117¾	119
National Lead pfd.	113	112½
New Jersey Zinc	152	147
Parke, Davis & Co.	78	76½
Pennsylvania Salt	87	85
Procter & Gamble	*130	*132
Sherwin-Williams	32	30½
Sherwin-Williams pfd.	*100½	*100½
Tenn. Copper & Chem.	9¼	9¼
Texas Gulf Sulphur	55½	58½
Union Carbide	53¾	54½
United Drug	76¼	77
United Dyewood	*45	42½
U. S. Industrial Alcohol	52	54½
U. S. Industrial Alcohol pfd.	*100	*100
Va.-Car. Chem. Co.	9½	9¾
Va.-Car. Chem. pfd.	25½	27½

*Nominal. Other quotations based on last sale.

Vegetable Oils and Fats

Crude Cottonseed Weak—Linseed Advances—China Wood Steady —Extra Tallow Higher

DEMAND for vegetable oils and fats was not so active as a week ago and prices were irregular. The feature was the decline in crude cottonseed oil. Linseed oil moved upwards on the advance in seed. Tallow steadied towards the close and a sale went through at an advance of ¼c. per lb.

Cottonseed Oil—The Department of Agriculture estimated the condition of the cotton crop as of September 25 at 49.5 per cent of normal. Based on the preliminary acreage figures this would indicate a crop of 11,015,000 bales, or approximately 1,200,000 bales more than production a year ago. The report was better than what traders expected and strengthened the opinion that the oil supply for this season will be in the neighborhood of 2,650,000 bbl., against 2,250,000 bbl. for the 1922-23 season. Selling pressure developed in futures and the option market on the Produce Exchange at one time sold off fully 50 points from the recent high. There was talk of a settlement in October oil, but sentiment regarding the current month was mixed up to the close. Part of the pressure in futures was attributed to selling of oil against purchases of lard. Stocks of lard in the Chicago district were decreased by more than 25,000,000 lb. in the past month, confirming reports of heavy shipments, especially for export. Cash trade in oil and compound was fair all week. Lard compound settled at 13¾@14c. per lb., carload lots. Offerings of crude oil increased. Compound makers were buyers and one operator took on more than 20 tanks of immediate crude on the basis of 8¾c. per lb., f.o.b. mills, Texas and Oklahoma. October crude settled around 8½c., with November-December at 8c. nominal. Bleachable oil was offered at 9¾c. per lb., tanks, f.o.b. Texas.

Linseed Oil—Early in the week there was a sharp advance in seed, both in the Northwest and in the Argentine, which strengthened the market for oil and brought about the uplift of 4c. per gal. Comparatively little business was placed at the higher figures, as paint makers were not disposed to contract far ahead until a better outlook on next year's seed supply may be had. The undertone towards the close was easier. Crop news from the Argentine has been favorable and with a larger acreage assured the bullish talk is confined almost entirely to nearby positions. New crop Argentine seed will not commence to move until after the turn of the year. Crushers raised the October quotation for oil to 94@95c. per gal., carload lots, cooperage basis, with November-December at 92c. and January forward at 90c. Stocks of flaxseed at Minneapolis amounted to 359,526 bu., comparing with 258,730 bu. a week ago and 20,603 bu. a year ago. The Canadian crop is estimated at 6,832,000 bu.

China Wood Oil—There was a fair call for prompt oil and sales were reported at 22c. per lb., in bbl., carload lots. October-December shipment oil was offered at 21c. per lb., tank car basis, f.o.b. New York. Cables from China reported light offerings.

Coconut Oil—The market was quiet, but steady. Ceylon type oil in drums sold at 10c. per lb., spot New York.

Crude cottonseed oil sold at 8¼c. per lb., immediate shipment from Texas, which compares with 9¼c. a week ago. Refiners were credited with exerting pressure in the options market for refined oil. The cotton crop report had a depressing influence upon futures. Linseed oil advanced in sympathy with seed. Coconut oil was steady. Soap makers take on tallow at higher prices. Palm oils were inactive. English rapeseed oil higher. Crude menhaden oil sells at 47½c. factory. Lard stocks reduced.

The tank car quotation, nearby positions, held at 8⅝@8¾c. per lb., f.o.b. New York. On the Pacific coast 8¼c. was asked in prompt shipment oil and 8¼c. on futures, sellers' tanks. Copra held at 4¾@4¾c. c.i.f. Pacific ports.

Corn Oil—Prompt shipment crude sold at 10c. per lb., f.o.b. Chicago, sellers' tanks. For crude corn oil in cooperage 11¼c. was asked, f.o.b. New York.

Olive Oil Foots—Prime green Italian foots were unchanged at 8½@8¾c. per lb. Demand was quiet.

Palm Oils—Resale lots came on the market at slight concessions from the prevailing cost of import. Lagos for shipment held at 7⅝c., with Niger at 7¼c. per lb. Demand was routine only, because of the irregular market for tallow.

Rapeseed Oil—English markets were higher and traders here raised the import cost to 76c. per gal.

Soya Bean Oil—Offerings at 9¼c. per lb., sellers' tanks, duty paid, f.o.b. New York, were in evidence. Some buying interest developed late in the week.

Fish Oils—Crude menhaden oil sold at 47½c. per gal., tank cars, f.o.b. Baltimore. The undertone was steady. Fishing was interrupted several days last week by stormy weather. English cod oil was offered at 59c. per gal., c.i.f. New York, which compares with sales at 56c. per gal. a week ago. Newfoundland tanked cod oil was offered at 64@65c. per gal., spot New York.

Tallow, Etc.—One lot of 200 drums of extra tallow sold at 7¾c. per lb., an advance of ¼c. Prices steadied on reports that several soapers were about to come into the market for round lots. Yellow grease advanced ¼c., closing at 6⅝@6¾c. per lb. Oleo stearine held at 13c. asked.

Miscellaneous Materials

Antimony—Resale offerings were reported at 7⅝c. per lb. and the market presented an unsettled appearance. On futures 5½c. was asked, c.i.f. New York.

Glycerine—With no change in the crude situation refiners reported the market as steady, chemically pure holding at 17@17½c. per lb., the inside figure obtaining on carload lots. Dynamite was firmer in some directions and settling prices ranged from 16¾@17c. per lb., with no sales reported. Saponification, basis 88 per cent, was nominally unchanged at 12½c. per lb., loose. Soap lye, basis 80 per cent, closed at 11½c. asked, loose, f.o.b. shipping point.

Naval Stores—Export trade was slow and with domestic trading also restricted the market eased off to the extent of 2c. per gal. on spirits of turpentine, closing at 98c. per gal., in bbl., ex dock, New York. Offerings of low grade rosin increased and prices eased slightly, closing on the basis of $5.85 per bbl. on the "B" quality.

Shellac — Stocks appear to be in firmer hands and with primary markets steady at the recent advance the undertone here strengthened. Demand showed improvement. T.N. settled at 64@65c. per lb., an advance of 2c. for the week. Bleached bonedry was raised to 73@74c. per lb.

Fullers Earth — Demand fair and prices steady. On the 60 to 100 mesh first hands quote $14.50 per ton; 16 to 60 mesh, $18 per ton, f.o.b. mines, Florida.

White Lead—There was no change in the metal, leading interests asking 6.85c. per lb. The corroders reported seasonal call for lead pigments and the undertone of the market was steady in nearly all directions. Standard dry white lead, basic carbonate, was offered at 9¾c. per lb., in casks, carload lots. The sulphate was available at 8¾c. per lb.

Waxes—Number 1 yellow carnauba for immediate delivery was offered at 36c. per lb. No. 3 North Country closed at 16½c., spot or forward delivery. Benguella beeswax, crude, October-November shipment, settled at 22c. per lb. Candelilla wax steady at 24c. per lb. Crude scale paraffine unchanged at 2¾@3c. per lb., carload basis, f.o.b. refinery.

Zinc Oxide—There was no change in the general situation, business being routine only and competition keen. Leading producers quote 8c. per lb. on the American process, lead free, and 7@7¼c. per lb. on the leaded grades. French process, red seal, held at 9¾c. per lb.

Imports at the Port of New York

September 28 to October 4

ACIDS—Cresylic—132 dr., Liverpool, W. Foster. **Diacthylbarbituric**—3 cs., Hamburg, Seaboard National Bank. **Phosphoric**—200 demijohns, Rotterdam, Order. **Tartaric**—584 csk., Rotterdam, Order. **Stearic**—40 cs. Rotterdam, M. W. Parsons & Plymouth Organic Laboratories. **Tartaric**—20 csk., Liverpool, Duncan, Fox & Co.

ALCOHOL—125 bbl. denatured, Arecibo, C. Esteva.

ALBUMEN—32 cs., Shanghai, F. A. Cundill & Co.

AMMONIUM CARBONATE — 10 bbl., Liverpool, Brown Bros. & Co.

ANTIMONY REGULUS—500 cs., Shanghai, International Banking Corp.

ARSENIC—119 bbl., Tampico, American Smelting & Refining Co.; 91 bbl., Tampico, American Metal Co.; 375 cs., Shanghai, Wah Chang Trading Corp.

BARIUM SUPEROXIDE—38 csk., Hamburg, W. A. Brown & Co.

BARIUM CARBONATE—81 csk., Hamburg, Philipp Bauer Co.

BARYTES — 16 csk., Hamburg, Globe Shipping Co.

BROMIDES—11 cs. ammonium, 35 cs. sodium and 30 cs. potassium, Hamburg, Fidelity International Trust Co.

CARBIDE—282 dr. and 338 bg., Hamburg, Order.

CASEIN—40 bbl., Southampton, A. Hurst & Co.; 500 bg., Buenos Aires, Kalbfleisch Corp.

CHALK—128 bbl., Hamburg, Cooper & Cooper; 1,000 bg., Antwerp, Bankers Trust Co.; 2 lots (bulk), Dunkirk, Taintor Trading Co.; 100 bbl., Hamburg, Cooper & Copper.

CHEMICALS—110 csk. and 2 cs., Hamburg, Jungmann & Co.; 95 dr., Hamburg, A. Kramer & Co.; 62 carboys, Hamburg, Montanin Co.; 10 bbl. and 1 cs., Hamburg, Eimer & Amend; 271 csk., Rotterdam, Chemical National Bank; 142 csk., Rotterdam, Equitable Trust Co.; 260 csk., Rotterdam, American Exchange National Bank; 129 csk., Rotterdam, Hummel & Robinson; 144 cs., Rotterdam, Order; 250 bg., Glasgow, Truempy, Faesy & Besthoff; 500 bg., Glasgow, Brown Bros. & Co.; 10 pkg., Hamburg, Pfaltz & Bauer; 69 dr., Hamburg, Superfos Co.; 19 cs., Hamburg, Jungmann & Co.; 73 dr., Hamburg, Speiden, Whitfield & Co.; 91 bbl., Hamburg, Unexcelled Mfg. Co.

CHINA CLAY—1894 tons (bulk), Fowey, J. W. Higman & Co.; 1606 tons (bulk), Fowey, Baring Bros. & Co.

COAL-TAR DISTILLATE — 41 bbl., Liverpool, Monsanto Chemical Works.

COBALT SULPHATE—6 csk., Hamburg, Roessler & Hasslacher Chemical Co.

COLORS — 15 csk. dry, Southampton, Order; 4 bbl. aniline, Antwerp, Fidelity Int'l Trust Co.; 19 pkg., Havre, Sando Chemical Works; 10 csk. aniline, Havre, Advance Chemical Works; 9 pkg. do., Havre, Irving Bank-Col. Trust Co.; 143 csk., Havre, Ciba Co.; 22 csk., Havre, Carbic Color & Chemical Co.; 29 csk., Havre, Geigy Co.; 15 csk., Havre, Carbic Color Co.; 12 csk., Havre, Order; 2 csk., Liverpool, Kuttroff, Pickhardt & Co.; 3 csk., Hamburg, Grasselli Chemical Co.; 6 csk., Hamburg, Kuttroff, Pickhardt & Co.

COPRA—200 bg., Port Antonio, Banana Sales Corp.; 51 bg., Morants Bay, Franklin Baker Co.

DIVI-DIVI — 362 bg., Curaçao, Ultramares Corp.; 676 bg., Pampatar, Eggers & Heinlein; 700 bg., Pampatar, Goldsmith & Co.

DEXTRINE—400 bg. potato, Rotterdam, Stein, Hall & Co.

DYESTUFFS—43 pkg., London, Grasselli Chemical Co.; 15 pkg., London, G. A. Kuhl; 40 pkg., London, Kuttroff, Pickhardt & Co.; 9 pkg., London, Garfield Aniline Works; 4 pkg., London, Carbic Color & Chemical Co.; 10 pkg., London, Equitable Trust Co.; 30 pkg., London, American Aniline Products Co.; 4 cs. aniline, Genoa, Banca Comm. Italo; 2 csk., Genoa, Wetherwald & Pfister Co.; 44 csk., Genoa, Irving Bank-Col. Trust Co.; 8 csk., Genoa, Order; 6 csk. aniline, Antwerp, Geigy Co., Inc.; 5 cs. alizarine, Liverpool, A. Klipstein & Co.

FLUORSPAR—555,800 kilos, Hamburg, American Steel Export Co.; 182 bg., Hamburg, L. A. Salomon & Bro.

FULLERS EARTH — 450 bg., London, C. B. Chrystal & Co.

FUSEL OIL—6 dr., Valencia, Maas & Waldstein; 6 dr., Sourabaya, Banque Belge Pour L'Etranger.

GLAUBER SALT—251 csk., Hamburg, Ellis, Jackson & Co.; 257 bbl., Hamburg, E. Suter & Co.

GUMS — 268 bg. arabic, Port Sudan, Orbis Products Trading Co.; 525 bg. do., Port Sudan, Thurston & Braidich; 511 bg. copal, Antwerp, Chemical National Bank; 255 bg. do., Antwerp, W. Schall & Co.; 405 bg. copal, Antwerp, Central Union Trust Co.; 200 cs. damar, Batavia, Order; 1352 bg. karaya, Bombay, Order.

GRAPHITE—500 bg. Genoa, Order; 482 csk., Marseilles, Order.

IRON OXIDE—120 bbl., Malaga, J. L. Smith & Co.; 164 bbl., Malaga, Reichard Coulston, Inc.; 114 bbl., Malaga, Scott L. Libby Corp.; 15 bbl. Malaga, A. E. Rittwagen; 39 bbl., Malaga, Smith Color & Chemical Co.; 342 bbl., Malaga, W. Schall & Co.; 4 bbl., Malaga, C. R. Rincones; 78 bbl., Malaga, National City Bank; 33 bbl., Malaga, Order; 25 csk., Liverpool, J. A. McNulty; 54 csk., Liverpool, C. B. Chrystal Co.; 10 csk., Liverpool, Battery Park National Bank.

LITHOPONE — 100 csk., Rotterdam, Reichard, Coulston, Inc.

LOGWOOD EXTRACT—7 bbl., Havre, Morris Export Co.

MENTHOL—10 cs., Southampton, Baring Bros. & Co.

MAGNESITE — 103 bbl., Rotterdam, Speiden, Whitfield, Inc.

MANGANESE DIOXIDE—55 tons, Coquimbo, W. R. Grace & Co.

MAGNESIUM CARBONATE — 672 bg., Glasgow, E. M. Sergeant & Co.

MAGNESIUM CHLORIDE — 250 dr., Hamburg, Innis, Speiden & Co.

MYROBALANS—1,400 pkg. whole, Calcutta, National City Bank; 4,750 pkt. whole and 4,480 pkt. crushed, Calcutta, Order; 675 bg. Bombay, Order; 7,269 bg., Calcutta, National City Bank; 5,494 pkt., Calcutta, Order.

NAPHTHALENE — 511 dbl. bg., Hamburg, Order.

OILS—Cod—100 csk., St. Johns, H. W. Dickinson, 25 csk., St. Johns, Order. **Coconut** — 851 tons (bulk), Manila, Order. **Linseed**—129 dr., Rotterdam, W. Van Doorn. **Olive foots** (sulphur oil)—150 bbl., Naples, Ellis, Jackson & Co. **Palm**—76 csk., Liverpool, Order; 449 csk., Liverpool, Order. **Sesame**—15 bbl., Rotterdam, Order; 5 csk. and 28 dr., Rotterdam, Order. **Sperm**—30 bbl., Glasgow, Order.

OIL SEEDS—Castor—10,928 bg., Coconada, Order.

OCHER — 125 csk., Marseilles, J. L. Smith & Co.; 20 csk., Marseilles, L. H. Butcher & Co.

POTASSIUM SALTS—380 dr. caustic, Hamburg, T. Goldsmith Corp.; 168 bbl. caustic, Hamburg, Roessler & Hasslacher Chemical Co.; 59 bbl. alum, Hamburg, Order; 1,209 bbl. carbonate, Constantinople, Order; 300 csk. chlorate, Marseilles, C. W. Campbell & Co.; 950 bbl. chlorate, Marseilles, Order; 1,500 bg. sulphate, Bremen, Potash Importing Co. of America; 11 csk. prussiate, Liverpool, Order; 100 csk. alum, Hamburg, E. Suter & Co.; 30 bbl. alum, Hamburg, Order; 175 csk. carbonate, Hamburg, Order; 75 dr. caustic, Hamburg, Order.

PITCH—30 bbl., Liverpool, Order.

PLUMBAGO — 1,224 bbl., Malipuram, Order.

PYRIDINE—6 dr., Hamburg, Williamson & Co.; 1 dr. Hamburg, Syrup Products Co.

QUICKSILVER—1,000 flask, Alicante, National City Bank; 44 flask, Tampico, Graham, Hinkley & Co.; 73 flask, Tampico, G. Ramos; 600 flask, Trieste, Order.

QUEBRACHO—11,901 bg. extract, Tannin Corp.

SAL AMMONIAC — 182 bbl., Hamburg, Irving Bank-Col. Trust Co.; 20 bbl., Hamburg, J. Monroe & Co.

SHELLAC—198 bg., London, Order; 775 bg. refuse, Calcutta, Bank of the Manhattan Co.; 100 bg., Calcutta, British Bank of South Am.; 100 bg., Calcutta, N. Y. Trust Co.; 300 cs., Calcutta, First National Bank of Boston; 150 bg., Calcutta, Mechanics & Metals National Bank; 3,326 pkg., Calcutta, Order; 85 cs., Southampton, Order; 35 bg., Hamburg, Irving Bank-Col. Trust Co.

SILVER SULPHIDE—2 cs., South Pacific ports, American Metal Co.

SILICO MANGANESE—8 csk., Havre, De Courcy Browne.

SODIUM SALTS—121 dr. sulphite, Hamburg, S. C. Grant & Co.; 10 cs. superoxide, Hamburg, Cooper & Cooper, Inc.; 70 dr. perchloride, Hamburg, Roessler & Hasslacher Chemical Co.; 34 csk. yellow prussiate, Rotterdam, Order; 18,084 bg. nitrate, Iquique, W. R. Grace & Co.; 250 cs. cyanide, Havre, Meteor Products Co.; 168 cs., Havre, Hardy & Ruperti; 500 bg. sulphate, Glasgow, J. Turner & Co.; 35 dr. cyanide, Liverpool, Order; 275 dr. sulphite, Hamburg, C. S. Grant & Co.

STEARINE PITCH—132 bbl., Glasgow, Irving Bank-Col. Trust Co.

STARCH — 50 bbl., Hamburg, Habicht Braun & Co.

SUMAC—10 csk. extract, Glasgow, American Dyewood Co.

TANNIN—20 pkg., Corral, Order; 11 csk., Antwerp, Geigy Co., Inc.

TARTAR — 442 bg., Marseilles, Tartar Chemical Co.; 603 bg., Marseilles, C. Pfizer & Co.; 534 sk., Barcelona, Harshaw, Fuller & Goodwin; 188 bg., Tarragona, Tartar Chemical Works; 89 csk., Naples, Tartar Chemical Works.

TETRACHLORETHANE—8 csk., Hamburg, Globe Shipping Co.

THORIUM NITRATE—20 cs., Hamburg, American Kreuger & Toll Corp.

WAXES—198 bg. montan, Hamburg, L. A. Salomon & Bros.; 30 bg. bees, Rotterdam, Ponds Extract Co.; 75 cs. bees, Rotterdam, Order; 111 bg. carnauba, Ceara, Philadelphia National Bank; 43 bg. do., Ceara, Int'l Acceptance Bank; 111 bg. do., Ceara, Order; 68 bg. do., Pernambuco, Order; 312 bg. do., Parnahyba, National City Bank; 56 bg. do., Parnahyba, Order; 22 bg. montan, Hamburg, Jacobs & Allison; 11 bg. bees, Hamburg, Order; 131 bg. bees, Santos, American Trading Co.

WHITE LEAD—100 bbl., Venice, Fezandie & Sperrle.

WOOL GREASE—60 bbl., Hamburg, G. Kuhlmann; 200 bbl., Antwerp, Mechanics & Metals National Bank.

WHITING—2,500 bg. powdered, Dunkirk, Thac Industrial Co.; 100 bg., Antwerp, I. Potter; 50 bg., Antwerp, A. Baum.

Current Prices in the New York Market

For Chemicals, Oils and Allied Products

THESE prices are for the spot market in New York City, but a special effort has been made to report American manufacturers' quotations whenever available. In many cases these are for material f.o.b. works or on a contract basis and these prices are so designated. Quotations on imported stocks are reported when they are of sufficient importance to have a material effect on the market. Prices quoted in these columns apply to large quantities in original packages.

General Chemicals

Acetone, drums	lb.	$0.25 – $0.25½
Acid, acetic, 28%, bbl.	100 lb.	3.38 – 3.50
Acetic, 56%, bbl.	100 lb.	6.75 – 7.00
Acetic, 80%, bbl.	100 lb.	9.58 – 9.83
Glacial, 99½%, bbl.	100 lb.	12.00 – 12.78
Acetic anhydride, 85%, dr.	lb.	.38 – ....
Boric, bbl.	lb.	.10 –
Citric, kegs	lb.	.49 – .50
Formic, 85%	lb.	.12 – .14
Gallic, tech.	lb.	.45 – .50
Hydrofluoric, 52%, carboys	lb.	.11 – .12
Lactic, 44%, tech., light, bbl.	lb.	.11½ – .12
22% tech., light, bbl.	lb.	.05½ – .06
Muriatic, 18° tanks	100 lb.	.90 – 1.00
Muriatic, 20°, tanks	100 lb.	1.00 – 1.10
Nitric, 36°, carboys	lb.	.04½ – .05
Nitric, 42°, carboys	lb.	.06 – .06½
Oleum, 20%, tanks	ton	18.50 – 19.00
Oxalic, crystals, bbl.	lb.	.11½ – .12
Phosphoric, 50% carboys	lb.	.07½ – .08½
Pyrogallic, resublimed	lb.	1.50 – 1.60
Sulphuric, 60°, tanks	ton	9.00 – 11.00
Sulphuric, 60°, drums	ton	13.00 – 14.00
Sulphuric, 66°, tanks	ton	15.00 – 16.00
Sulphuric, 66° drums	ton	20.00 – 21.00
Tannic, U.S.P., bbl.	lb.	.65 – .70
Tannic, tech., bbl.	lb.	.45 – .50
Tartaric, imp., powd., bbl.	lb.	.32 – .33
Tartaric, domestic, bbl.	lb.	.34½ – ....
Tungstic, per lb.	lb.	1.10 – 1.20
Alcohol, butyl, drums, f.o.b. works	lb.	.26 – .28
Alcohol ethyl (Cologne spirit), bbl.	gal.	4.78 – ....
Ethyl, 190 p'f, U.S.P., bbl.	gal.	4.75 – ....
Alcohol, methyl (see Methanol)		
Alcohol, denatured, 190 proof		
No. 1, special bbl.	gal.	.46 – ....
No. 1, 190 proof, special, dr.	gal.	.40 – ....
No. 1, 188 proof, bbl.	gal.	.47 – ....
No. 1, 188 proof, dr.	gal.	.41 – ....
No. 5, 188 proof, bbl.	gal.	.45 – ....
No. 5, 188 proof, dr.	gal.	.39 – ....
Alum, ammonia, lump, bbl.	lb.	.03½ – .04
Potash, lump, bbl.	lb.	.03½ – .04½
Chrome, lump, potash, bbl.	lb.	.06 – .07
Aluminum sulphate, com., bags	100 lb.	1.40 – 1.50
Iron free bags	lb.	2.40 – 2.50
Aqua ammonia, 26°, drums	lb.	.07 – .07½
Ammonia, anhydrous, cyl.	lb.	.30 – .30½
Ammonium carbonate, powd. casks, imported	lb.	.09½ – .10
Ammonium carbonate, powd. domestic, bbl.	lb.	.13 – .14
Ammonium nitrate, tech., casks	lb.	.10 – .11
Amyl acetate tech., drums	gal.	4.50 – 4.75
Antimony Sulphuret, golden	lb.	.19 – .20
Arsenic, white, powd., bbl.	lb.	.11½ – .12½
Arsenic, red, powd., kegs	lb.	.15 – .15½
Barium carbonate, bbl.	ton	68.00 – 70.00
Barium chloride, bbl.	ton	82.00 – 88.00
Barium dioxide, drums	lb.	.18 – .18½
Barium nitrate, casks		.07½ – .08
Blanc fixe, dry, bbl.	lb.	.04 – .04½
Bleaching powder, f.o.b. wks., drums	100 lb.	1.50 – 1.75
Spot N. Y. drums	100 lb.	2.00 – 2.10
Borax, bbl.	lb.	.05½ – .05½
Bromine, cases	lb.	.28 – .30
Calcium acetate, bags	100 lb.	4.00 – 4.05
Calcium arsenate, dr.	lb.	.14 – .15
Calcium carbide, drums	lb.	.05½ – .05½
Calcium chloride, fused, dr. wks.	ton	21.00 – ....
Gran. drums works	ton	27.00 – ....
Calcium phosphate, mono, bbl.	lb.	.06½ – .07
Camphor, cases	lb.	.86 – .87
Carbon bisulphide, drums	lb.	.07 – .07½
Carbon tetrachloride, drums	lb.	.09 – .09½
Chalk, precip.—domestic, light, bbl.	lb.	.04½ – .04½
Domestic, heavy, bbl.	lb.	.03½ – .03½
Imported, light, bbl.	lb.	.04½ – .05
Chlorine, liquid, tanks, wks.	lb.	.04½ – .05
Cylinders, 100 lb., wks.	lb.	.05½ – .06½
Cylinders, 100 lb., spot	lb.	.08½ – .09
Chloroform, tech., drums	lb.	.28 – .32
Cobalt, oxide, bbl.	lb.	2.10 – 2.25
Copperas, bulk, f.o.b. wks.	ton	22.00 – 25.00
Copper carbonate, bbl.	lb.	.18 – .19
Copper cyanide, drums	lb.	.47 – .50
Copper sulphate, dom., bbl., 100 lb.	100 lb.	4.90 – 5.00
Imp. bbl.	100 lb.	4.50 – 4.60
Cream of tartar, bbl.	lb.	.24½ – .25½
Epsom salt, dom., tech., bbl.	100 lb.	1.75 – 2.00
Epsom salt, imp., tech., bags	100 lb.	.90 – 1.00
Epsom salt, U.S.P., dom., bbl.	100 lb.	2.25 – 2.50
Ether, U.S.P., resale, dr.	lb.	.13 – .15
Ethyl acetate, 85%, drums	gal.	.80 – .81
Ethyl acetate, ether, 98% to 100%)	gal.	$0.95 – $1.00
Formaldehyde, 40%, bbl.	lb.	.11½ – .12½
Fullers earth—f.o.b. mines	ton	18.00 – 20.00
Fusel oil, ref., drums	gal.	.... – ....
Fusel oil, crude, drums	gal.	4.25 – ....
Glaubers salt, wks., bags	100 lb.	1.20 – 1.40
Glaubers salt, imp., bags	100 lb.	.90 – .95
Glycerine, c.p., drums extra	lb.	.17 – .17½
Glycerine, dynamite, drums	lb.	.16½ – .17
Glycerine, crude 80%, loose	lb.	.11½ – ....
Iron oxide, red, casks	lb.	.12 – .18
Lead:		
White, basic carbonate, dry, casks	lb.	.09½ – .09½
White, basic sulphate, casks	lb.	.08½ – .09
White, in oil, kegs	lb.	.11½ – .11½
Red, dry, casks	lb.	.10½ – .10½
Red, in oil, kegs	lb.	.13 – .14½
Lead acetate, white crys., bbl.	lb.	.14 – .14½
Brown, broken, casks	lb.	.13 – .13½
Lead arsenate, powd., bbl.	lb.	.18 – .20
Lime-Hydrated, bg, wks.	ton	10.50 – 12.50
Bbl., wks.	ton	18.00 – 19.00
Lime, Lump, bbl.	280 lb.	3.63 – 3.65
Litharge, comm., casks	lb.	.10½ – .10½
Lithophone, bags	lb.	.07 – .07½
in bbl.	lb.	.07½ – .07½
Magnesium carb., tech., bags	lb.	.08 – .08½
Methanol, 95%, bbl.	gal.	.98 – 1.00
Methanol, 97%, bbl.	gal.	1.00 – 1.02
Methyl-acetone, t'ks.	gal.	1.15 – ....
Nickel salt, double, bbl.	lb.	.10½ – ....
Nickel salts, single, bbl.	lb.	.11½ – ....
Phosgene		.60 – .75
Phosphorus, red, cases	lb.	.... – ....
Phosphorus, yellow, cases	lb.	.35 – .40
Potassium bichromate, casks	lb.	.09½ – .09¾
Potassium bromide, gran., bbl.	lb.	.19 – .20
Potassium carbonate, 80-85%, calcined, casks	lb.	.06½ – .06½
Potassium chlorate, powd.	lb.	.07½ – .08½
Potassium cyanide, drums	lb.	.47 – .52
Potassium, first sorts, cask	lb.	.07½ – .07¾
Potassium hydroxide (caustic potash) drums	lb.	.07 – .07½
Potassium iodide, cases	lb.	3.65 – 3.75
Potassium nitrate, bbl.	lb.	.07½ – .09
Potassium permanganate, drums	lb.	.18 – .18½
Potassium prussiate, red, casks	lb.	.60 – .63
Potassium prussiate, yellow, casks	lb.	.29 – .30
Salammoniac, white, gran., casks, imported	lb.	.06½ – .06½
Salammoniac, white, gran., bbl., domestic	lb.	.07½ – .07½
Gray, gran., casks	lb.	.08 – .09
Salsoda, bbl.	100 lb.	1.20 – 1.40
Salt cake (bulk)	ton	24.00 – 25.00
Soda ash, light, 58% flat, bulk, contract	100 lb.	1.33 – ....
bags, contract	100 lb.	1.45 – ....
Soda ash, dense, bulk, contract, basis 58%	100 lb.	1.42 – ....
bags, contract	100 lb.	1.51 – ....
Soda, caustic, 76%, solid, drums contract	100 lb.	3.16 – ....
Soda, caustic, ground and flake, contracts, dr.	100 lb.	3.60 – 3.85
Soda, caustic, solid, 76% f. a. s. N. Y.	100 lb.	3.05 – 3.10
Sodium acetate, works, bags	lb.	.05½ – .05½
Sodium bicarbonate, bulk	100 lb.	1.75 – ....
330-lb. bbl.	100 lb.	2.00 – ....
Sodium bichromate, casks	lb.	.07½ – .07½
Sodium bisulphate (niter cake)	ton	6.00 – 7.00
Sodium bisulphite, powd., U.S.P., bbl.	lb.	.04½ – .04½
Sodium chlorate, kegs	lb.	.06½ – .07
Sodium chloride	long ton	12.00 – 13.00
Sodium cyanide, cases	lb.	.19 – .22½
Sodium fluoride, bbl.	lb.	$0.08½ – $0.10½
Sodium hyposulphite, bbl.	lb.	.02½ – .02½
Sodium nitrite, casks	lb.	.07½ – ....
Sodium peroxide, powd., cases	lb.	.28 – .30
Sodium phosphate, dibasic, bbl.	lb.	.03½ – .04
Sodium prussiate, yel. drums	lb.	.13½ – .14
Sodium salicylic, drums	lb.	.40 – .42
Sodium silicate (40°, drums)	100 lb.	.75 – 1.15
Sodium silicate (60°, drums)	100 lb.	1.75 – 2.00
Sodium sulphide, fused, 60-62% drums	lb.	.03 – .04
Sodium sulphite, crys., bbl.	lb.	.03½ – .03½
Strontium nitrate, powd., bbl.	lb.	.11 – .12
Sulphur chloride, yel drums	lb.	.04½ – .05
Sulphur, crude	ton	18.00 – 20.00
At mine, bulk	ton	16.00 – 18.00
Sulphur, flour, bag	100 lb.	2.25 – 2.35
Sulphur, roll, bag	100 lb.	2.00 – 2.10
Sulphur dioxide, liquid, cyl.	lb.	.08 – .08½
Tin bichloride, bbl.	lb.	.12 – .12½
Tin oxide, bbl.	lb.	.47 – ....
Tin crystals, bbl.	lb.	.31½ – .32
Zinc carbonate, bags	lb.	.14 – .14½
Zinc chloride, gran, bbl.	lb.	.06½ – .06½
Zinc cyanide, drums	lb.	.37 – .38
Zinc oxide, , lead free, bbl.	lb.	.08 – .08½
5% lead sulphate, bags	lb.	.07½ – ....
10 to 35 % lead sulphate, bags	lb.	.07 – ....
French, red seal, bags	lb.	.09½ – ....
French, green seal, bags	lb.	.10½ – ....
French, white seal, bbl.	lb.	.12 – ....
Zinc sulphate, bbl.	100 lb.	2.75 – 3.25

Coal-Tar Products

Alpha-naphthol, crude, bbl.	lb.	$0.60 – $0.70
Alpha-naphthol, ref., bbl.	lb.	.65 – .80
Alpha-naphthylamine, bbl.	lb.	.35 – 36
Aniline oil, drums	lb.	.16 – .16½
Aniline salts, bbl.	lb.	.22 – 23
Anthracene, 80%, drums	lb.	.75 – .80
Anthracene, 80%, imp., drums, duty paid	lb.	.65 – .70
Anthraquinone, 25% paste, drums	lb.	.80 – .85
Benzaldehyde U.S.P., carboys	lb.	1.50 – ....
f.f.c. drums	lb.	1.60 – ....
tech, drums	lb	75 – ....
Benzene, pure, water-white, tanks and drums	gal.	.27 – ....
Benzene, 90%, tanks & drums	gal.	.25 – ....
Benzidine base, bbl.	lb.	.80 – .85
Benzidine sulphate, bbl.	lb.	.75 – ....
Benzoic acid, U.S.P., kegs	lb.	.80 – 85
Benzoate of soda, U.S.P., bbl.	lb.	.65 – .70
Benzyl chloride, 95-97%, ref., drums	lb.	.45 – ....
Benzyl chloride, tech., drums	lb.	.30 – .35
Beta-naphthol, tech., bbl.	lb.	.21 – .22
Beta-naphthylamine, tech.	lb.	.75 – .80
Cresol, U.S.P., drums	lb.	.25 – .29
Ortho-cresol, drums	lb.	.28 – .32
Cresylic acid, 97%, works drums	gal.	.75 – .85
95-97%, drums, works	gal.	.70 – .75
Dichlorbenzene, drums	lb.	.06 – .08
Diethylaniline, drums	lb.	.50 – .60
Dimethylaniline, drums	lb.	.41 – .42
Dinitrobenzene, bbl.	lb.	.19 – .20
Dinitrochlorbenzene, bbl.	lb.	.21 – .22
Dinitronaphthalen, bbl.	lb.	.30 – .32
Dinitrophenol, bbl.	lb.	.35 – .40
Dinitrotoluen, bbl.	lb.	.20 – .22
Dip oil, 25%, drums	gal.	.25 – .30
Diphenylamine, bbl.	lb.	.50 – .52
H-acid, bbl.	lb.	.75 – .80
Meta-phenylenediamine, bbl.	lb.	1.00 – 1.05
Michlers ketone, bbl.	lb.	3.00 – 3.50
Monochlorbenzene, drums	lb.	.08 – .10
Monoethylaniline, drums	lb.	.95 – 1.10
Naphthalene, flake, bbl.	lb.	.06½ – .06½
Naphthalene, balls, bbl.	lb.	.07 – .07½
Naphthionate of soda, bbl.	lb.	.60 – .65
Naphthionic acid, crude, bbl.	lb.	.55 – .60
Nitrobenzene, drums	lb.	.09½ – .10½
Nitro-naphthalene, bbl.	lb.	.30 – .35
Nitro-toluene, drums	lb.	.13½ – .14½
N-W acid, bbl.	lb.	1.20 – 1.25
Ortho-amidophenol, kegs	lb.	2.30 – 2.35
Ortho-dichlorbenzene, drums	lb.	.15 – .17
Ortho-nitrophenol, bbl.	lb.	1.20 – 1.30
Ortho-nitrotoluene, drums	lb.	.10 – .12
Ortho-toluidine, bbl.	lb.	.18 – .20
Para-amifiophenol, base, kegs	lb.	1.35 – ....
Para-amifiophenol, HCl, kegs	lb.	1.55 – ....
Para-dichlorbenzene, bbl.	lb.	.17 – .20
Paranitroaniline, bbl.	lb.	.73 – .75
Para-nitrotoluene, bbl.	lb.	.60 – .65
Para-phenylenediamine, bbl.	lb.	1.45 – 1.50
Para-toluidine, bbl	lb.	.90 – .95
Phthalic anhydride, bbl.	lb.	.32 – .36
Phenol, U.S.P., dr.	lb.	.25 – .28
Picric acid, bbl.	lb.	.20 – .22
Pyridine, dom., drums	gal.	nominal
Pyridine, imp., drums	gal.	5.00 – 5.25
Resorcinol, tech., kegs	lb.	1.40 – 1.50

Resorcinol, pure, kegs	lb.	$2.15 –	$2.25
R-salt, bbl.	lb.	.55 –	.60
Salicylic acid, tech., bbl.	lb.	.30 –	.32
Salicylic acid, U.SP., bbl.	lb.	.35 –	....
Solvent naphtha, water-white, tanks	gal.	.27 –	....
Crude, tanks	gal.	.24 –	....
Sulphanilic acid, crude, bbl.	lb.	.18 –	.20
Thiocarbanilide, kegs	lb.	.35 –	.38
Toluidine, bbl.	lb.	1.00 –	1.05
Toluidine, mixed, kegs	lb.	.30 –	.35
Toluene, tank cars	gal.	.30 –	.32
Toluene, drums	gal.	.34 –	.36
Xylidine drums	lb.	.50 –	....
Xylene, pure, drums	gal.	.55 –	.60
Xylene, com., drums	gal.	.32 –	.34
Xylene, com., tanks	gal.	.28 –	.30

Naval Stores

Rosin B-D, bbl.	280 lb.	$5.85 –	....
Rosin E-I, bbl.	280 lb.	5.85 –	....
Rosin K-N, bbl.	280 lb.	5.95 –	....
Rosin W.G.-W.W., bbl.	280 lb.	6.50 –	$7.00
Wood rosin, bbl.	280 lb.	5.90 –	6.00
Turpentine, spirits of, bbl.	gal.	.98 –	....
Wood, steam dist., bbl.	gal.	.85 –	....
Wood, dest. dist., bbl.	gal.	.70 –	....
Pine tar pitch, bbl.	200 lb.	5.50 –	....
Tar, kiln burned, bbl.	500 lb.	11.00 –	....
Retort tar, bbl.	500 lb.	11.00 –	....
Rosin oil, first run, bbl.	gal.	.45 –	....
Rosin oil, second run, bbl.	gal.	.47 –	....
Rosin oil, third run, bbl.	gal.	.50 –	....
Pine oil, steam dist.	gal.	.65 –	....
Pine oil, pure, dest. dist.	gal.	.60 –	....
Pine tar oil, ref.	gal.	.48 –	....
Pine tar oil, crude, tanks f.o.b. Jacksonville, Fla.	gal.	.32 –	.32½
Pine tar oil, double ref., bbl.	gal.	.... –	.75
Pine tar, ref., thin, bbl.	gal.	.... –	.25
Pinewood creosote, ref., bbl.	gal.	.... –	.52

Animal Oils and Fats

Degras, bbl.	lb.	$0.04 –	$0.04½
Grease, yellow, bbl.	lb.	.06½ –	.06¾
Lard oil, Extra No. 1, bbl.	gal.	.86 –	.88
Neatsfootoil 20 deg. bbl.	gal.	1.20 –	1.25
No. 1, bbl.	gal.	.92 –	.94
Oleo Stearine	lb.	.12½ –	.13
Oleo oil, No. 1, bbl.	lb.	.13 –	.13¼
Red oil, distilled, d.p. bbl.	lb.	.09 –	....
Saponified, bbl.	lb.	.09 –	....
Tallow, extra, loose	lb.	.07½ –	....
Tallow oil, acidless, bbl.	gal.	.86 –	.88

Vegetable Oils

Castor oil, No. 3, bbl.	lb.	$0.13 –	....
Castor oil, No. 1, bbl.	lb.	.13½ –	....
Chinawood oil, bbl.	lb.	.22 –	.22½
Coconut oil, Ceylon, bbl.	lb.	.09½ –	.10
Ceylon, tanks, N.Y.	lb.	.08½ –	.08¾
Coconut oil, Cochin, bbl.	lb.	.10½ –	.10¾
Corn oil, crude, bbl.	lb.	11¼ –	....
Crude, tanks, (f.o.b. mill)	lb.	.10 –	....
Cottonseed oil, crude (f.o.b. mill), tanks	lb.	.08½ –	....
Summer yellow, bbl.	lb.	.12½ –	....
Winter yellow, bbl.	lb.	.13½ –	.13¾
Linseed oil, raw, car lots, bbl.	gal.	.94 –	.95
Raw, tank cars (dom.)	gal.	.88 –	.89
Boiled, cars, bbl. (dom.)	gal.	.96 –	.97
Olive oil, denatured, bbl.	gal.	1.10 –	1.12
Sulphur, (foots) bbl.	lb.	.08½ –	.08¾
Palm, Lagos, casks	lb.	.07¼ –	.07½
Niger casks	lb.	.07½ –	.07¾
Palm kernel, bbl.	lb.	.08 –	....
Peanut oil, crude, tanks (mill)	lb.	.13 –	....
Peanut oil, refined, bbl.	lb.	.14½ –	....
Perilla, bbl.	lb.	.14½ –	.14¾
Rapeseed oil, refined, bbl.	gal.	.76 –	.76½
Rapeseed oil, blown, bbl.	gal.	.82 –	....
Sesame, bbl.	lb.	.12½ –	.12½
Soya bean (Manchurian), bbl.	lb.	.10¼ –	....
Tank, f.o.b. Pacific coast	lb.	.09 –	....
Tank, (f.o.b. N.Y.)	lb.	.09¼ –	....

Fish Oils

Cod, Newfoundland, bbl.	gal.	$0.65 –	$0.67
Menhaden, light pressed, bbl.	gal.	.60 –	....
White bleached, bbl.	gal.	.62 –	....
Blown, bbl.	gal.	.67 –	....
Crude, tanks (f.o.b. factory)	gal.	.47½ –	....
Whale No. 1 crude, tanks, coast	lb.	.... –	....
Winter, natural, bbl.	gal.	.76 –	.78
Winter, bleached, bbl.	gal.	.79 –	.80

Oil Cake and Meal

Coconut cake, bags	ton	$30.00 –	$31.00
Copra, sun dried, bags, (c.i.f.)	lb.	.05¼ –	....
Sun dried Pacific coast	lb.	.04¾ –	....
Cottonseed meal, f.o.b. mills	ton	39.50 –	40.00
Linseed cake, bags	ton	37.00 –	....
Linseed meal, bags	ton	45.00 –	47.00

Dye & Tanning Materials

Albumen, blood, bbl.	lb.	$0.45 –	$0.50
Albumen, egg, tech, kegs	lb.	.95 –	1.00
Cochneal, bags	lb.	.32 –	.34
Cutch, Borneo, bales	lb.	.04 –	.04½
Cutch, Rangoon, bales	lb.	.15 –	.16
Dextrine, corn, bags	100 lb.	3.69 –	3.86
Dextrine, gum, bags	100 lb.	3.99 –	4.26
Divi-divi, bags	ton	38.00 –	39.00
Fustic, sticks	ton	30.00 –	35.00
Fustic, chips, bags	lb.	.04 –	.05
Logwood, sticks	ton	25.00 –	26.00
Logwood, chips, bags	lb.	.02½ –	.03
Sumac, leaves, Sicily, bags	ton	80.00 –	85.00
Sumac, ground, bags	ton	$75.00 –	$80.00
Sumac, domestic, bags	ton	40.00 –	42.00
Starch, corn, bags	100 lb.	3.12 –	3.39
Tapioca flour, bags	lb.	.07 –	.07½

Extracts

Archil, cone., bbl.	lb.	$0.18 –	$0.22
Chestnut, 25% tannin, tanks	lb.	.02 –	.03
Divi-divi, 25% tannin, bbl.	lb.	.04 –	.05
Fustic, crystals, bbl.	lb.	.20 –	.22
Fustic, liquid, 42°, bbl.	lb.	.08 –	.09
Gambier, liq., 25% tannin, bbl.	lb.	.08¼ –	.09¼
Hematine crys., bbl.	lb.	.14 –	.18
Hemlock, 25% tannin, bbl.	lb.	.03½ –	.04
Hypernic, solid, drums	lb.	.24 –	.26
Hypernic, liquid, 51°, bbl.	lb.	.09½ –	.10½
Logwood, crys., bbl.	lb.	.15 –	.16
Logwood, liq., 51° bbl.	lb.	.08 –	.08½
Quebracho, solid, 65% tannin, bbl.	lb.	.04½ –	.05
Sumac, dom., 51°, bbl.	lb.	.06½ –	.07½

Dry Colors

Blacks–Carbongas, bags, f.o.b. works, spot	lb.	$0.14 –	$0.18
Lampblack, bbl.	lb.	.12 –	.40
Mineral, bulk	ton	35.00 –	45.00
Blues–Bronze, bbl.	lb.	.50 –	.55
Prussian, bbl.	lb.	.50 –	.55
Ultramarine, bbl.	lb.	.08 –	.35
Browns, Sienna, Ital., bbl.	lb.	.06 –	.14
Sienna, Domestic, bbl.	lb.	.03½ –	.04
Umber, Turkey, bbl.	lb.	.04 –	.04½
Greens–Chrome, C.P. Light, bbl.	lb.	.30 –	.32
Chrome, commercial, bbl.	lb.	.12 –	.12½
Paris, bulk	lb.	.28 –	.30
Reds, Carmine No. 40, tins	lb.	4.50 –	4.70
Oxide red, casks	lb.	.10 –	.14
Para toner, kegs	lb.	1.00 –	1.10
Vermilion, English, bbl.	lb.	1.20 –	1.25
Yellow, Chrome, C.P. bbls.	lb.	.18 –	.18½
Ocher, French, casks	lb.	.02½ –	.03

Waxes

Bayberry, bbl.	lb.	$0.26 –	$0.27
Beeswax, crude, Afr. bg.	lb.	.22 –	.22½
Beeswax, refined, light, bags	lb.	.32 –	.34
Beeswax, pure white, cases	lb.	.40 –	.41
Candellila, bags	lb.	.24 –	.24½
Carnauba, No. 1, bags	lb.	.36 –	.38
No. 2, North Country, bags	lb.	.24 –	.25
No. 3, North Country, bags	lb.	.16½ –	.17
Japan, cases	lb.	.17 –	.18
Montan, crude, bags	lb.	.05 –	....
Paraffine, crude, match, 105-110 m.p., bbl.	lb.	.04½ –	.04¾
Crude, scale 124-126 m.p. bags	lb.	.02½ –	.03
Ref., 118-120 m.p., bags	lb.	.03½ –	....
Ref., 125 m.p., bags	lb.	.03¾ –	....
Ref. 128-130 m.p., bags	lb.	.03½ –	....
Ref., 133-135 m.p., bags	lb.	.04¼ –	.04¾
Ref., 135-137 m.p., bags	lb.	.05¼ –	.05½
Stearic acid, agle pressed, bags	lb.	.12½ –	.12¾
Double pressed, bags	lb.	.13 –	.13½
Triple pressed, bags	lb.	.14½ –	.14¾

Fertilizers

Ammonium sulphate, bulk, f.o.b. works	100 lb.	$3.20 –	$3.25
F.a.s. double bags	100 lb.	3.40 –	3.50
Blood, dried, bulk	unit	4.40 –	4.60
Bone, raw, 3 and 50, ground	ton	28.00 –	30.00
Fish scrap, dom., dried, wks.	unit	.... –	....
Nitrate of soda, bags	100 lb.	2.40 –	2.52½
Tankage, high grade, f.o.b. Chicago	unit	3.25 –	3.35
Phosphate rock, f.o.b. mines, Florida pebble, 68-72%	ton	4.00 –	4.50
Tennessee, 78-80%	ton	7.75 –	8.00
Potassium muriate, 80% bags	ton	34.55 –	....
Potassium sulphate, bags basis 90%	ton	43.67 –	....
Double manure salt	ton	25.72 –	....
Kainit	ton	7.22 –	....

Crude Rubber

Para—Upriver fine	lb.	$0.26 –	....
Upriver coarse	lb.	.22 –	....
Upriver caucho ball	lb.	.22½ –	....
Plantation—First latex crepe	lb.	.28 –	....
Ribbed smoked sheets	lb.	.28½ –	....
Brown crepe, thin, clean	lb.	.27 –	....
Amber crepe No. 1	lb.	.27½ –	....

Gums

Copal, Congo, amber, bags	lb.	$0.12 –	$0.18
East Indian, bold, bags	lb.	.23 –	.23½
Manila, pale, bags	lb.	.20 –	.20½
Pontinak, No. 1 bags	lb.	.20 –	.20½
Damar, Batavia, cases	lb.	.26 –	.26½
Singapore, No. 1, cases	lb.	.32 –	.33
Singapore, No. 2, cases	lb.	.23 –	.23½
Kauri, No. 1, cases	lb	.68 –	.70
Ordinary chips, cases	lb.	.21 –	.23
Manjak, Barbados, bags	lb.	.09 –	.09¼

Shellac

Shellac, orange fine, bags	lb.	$0.66 –	$0.67
Orange superfine, bags	lb.	.68 –	.69
A. C. garnet, bags	lb.	.65 –	....
Bleached, bonedry	lb.	.74 –	.75
Bleached, fresh	lb.	.63 –	.64
T. N., bags	lb.	.64 –	.65

Miscellaneous Materials

Asbestos, crude No. 1, f.o.b. Quebec	sh ton	$375.00 –	$500.00
Asbestos, shingle, f.o.b., Quebec	sh. ton	$55.00 –	$60.00
Asbestos, cement, f.o.b., Quebec	sh ton	20.00 –	25.00
Barytes, grd., white, f.o.b. mills, bbl.	net ton	16.00 –	20.00
Barytes, grd., off-color, f.o.b. mills bulk	net ton	13.00 –	15.00
Barytes, floated, f.o.b. St. Louis, bbl.	net ton	28.00 –	....
Barytes, crude f.o.b. mines, bulk	net ton	8.00 –	10.00
Casein, bbl., tech.	lb.	.14 –	.16
China clay (kaolin) crude, f.o.b. Ga.	net ton	6.00 –	8.00
Washed, f.o.b. Ga.	net ton	8.00 –	9.00
Powd., f.o.b. Ga.	net ton	14.00 –	20.00
Crude f.o.b. Va.	net ton	6.00 –	8.00
Ground, f.o.b. Va.	net ton	13.00 –	19.00
Imp., lump, bulk	net ton	15.00 –	20.00
Imp., powd.	net ton	45.00 –	50.00
Feldspar, No. 1 pottery	long ton	7.50 –	....
No. 2 pottery	long ton	6.00 –	....
No. 1 soap	long ton	8.50 –	....
No. 1 Canadian, f.o.b. mill	long ton	18.00 –	20.00
Graphite, Ceylon, lump, first quality, bbl.	lb.	.06 –	.06½
Ceylon, chip, bbl.	lb.	.04½ –	.05
High grade amorphous crude	ton	15.00 –	30.00
Gum arabic, amber, sorts, bags	lb.	.14 –	.16
Gum tragacanth, sorts, bags	lb.	.50 –	.55
No. 1, bags	lb.	1.45 –	1.50
Kieselguhr, f.o.b. Cal.	ton	40.00 –	42.00
F.o.b. N.Y.	ton	50.00 –	55.00
Magnesite, crude, f.o.b. Cal.	ton	14.00 –	15.00
Pumice stone, imp., casks	lb.	.03 –	.05½
Dom., lump, bbl.	lb.	.05 –	.05¼
Dom., ground, bbl.	lb.	.05½ –	.06
Silica, glass sand, f.o.b. Ind.	ton	2.00 –	2.50
Silica, sand blast, f.o.b. Ind.	ton	2.50	5.00
Silica, amorphous, 250-mesh, f.o.b. Ill.	ton	17.00 –	17.50
Silica, glass sand, f.o.b. Ill.	ton	1.50 –	3.00
Soapstone, coarse, f.o.b. Vt., bags	ton	7.00 –	8.00
Talc, 200 mesh, f.o.b., Vt., bags, extra	ton	6.00 –	8.00
Talc, 200 mesh, f.o.b. Ga., bags	ton	7.00 –	9.00
Talc, 325 mesh, f.o.b. New York, bags	ton	14.75 –	15.25

Mineral Oils

Crude, at Wells

Pennsylvania	bbl.	$2.50 –	2.75
Corning	bbl.	1.45 –	....
Cabell	bbl.	1.35 –	....
Somerset	bbl.	1.25 –	....
Illinois	bbl.	1.47 –	....
Indiana	bbl.	1.48 –	....
Kansas and Oklahoma, 28 deg.	bbl.	.70 –	....
California, 35 deg. and up	bbl.	1.04 –	....

Gasoline, Etc.

Motor gasoline, steel bbls.	gal.	$0.18½ –	....
Naphtha, V. M. & P. deod, steel bbls.	gal	.17½ –	....
Kerosene, ref. tank wagon	gal.	.14 –	....
Bulk, W.W. delivered, N.Y.	gal.	.06 –	....
Lubricating oils:			
Cylinder, Penn., dark	gal.	.21½ –	....
Bloomless, 30@31 grav.	gal.	.17½ –	....
Paraffin, pale	gal.	.15 –	.17
Spindle, 200, pale	gal.	.20½ –	.21
Petrolatum, amber, bbls.	lb.	.03½ –	.04
Paraffine wax (see waxes)			

Refractories

Bauxite brick, 56% Al_2O_3, f.o.b. Pittsburgh	1,000	$140–145	
Chrome brick, f.o.b. Eastern shipping points	ton	50–52	
Chrome cement, 40-50% Cr_2O_3	ton	23–27	
40-45% Cr_2O_3, sacks, f.o.b. Eastern shipping points	ton	23.00	
Fireclay brick, 1st. quality, 9-in. shapes, f.o.b. Ky. wks.	1,000	45–48	
2nd. quality, 9-in. shapes, f.o.b. wks.	1,000	38–42	
Magnesite brick, 9-in. straight (f.o.b. wks.)	ton	65–68	
9-in. arches, wedges and keys	ton	80–85	
Scraps and splits	ton	85	
Silica brick, 9-in. sizes, f.o.b. Chicago district	1,000	53–55	
Silica brick, 9-in. sizes, f.o.b. Birmingham district	1,000	53–54	
F.o.b. Mt. Union, Pa.	1,000	45–47	
Silicon carbide refract. brick, 9-in.	1,000	1,100.00	

Ferro-Alloys

Ferrotitanium, 15-18% f.o.b. Niagara Falls, N.Y.	ton	$200.00 –	$225.00
Ferrochromium, per lb. of Cr, 1-2% C	lb.	.28 –	.30
4-6% C	lb.	.12 –	....
Ferromanganese, 78-82% Mn, Atlantic seabd. duty paid	gr. ton	110.00 –	....
Spiegeleisen, 19-21% Mn.	gr. ton	45.00 –	47.00
Ferromolybdenum, 50-60% Mo, per lb Mo	lb.	2.00 –	2.50
Ferrosilicon, 10-12%	gr. ton	43.00 –	50.00
50%	gr. ton	85.00 –	....

Ferrotungsten, 70–80%, per lb. of W	lb.	$0.88 @ $0.95
Ferro-uranium, 35-50% of U. per lb. of U	lb.	4.50 – ....
Ferrovanadium, 30-40%, per lb. of V	lb.	3.50 – 4.50

Ores and Semi-finished Products

Bauxite, dom. crushed dried, f.o.b. shipping points	ton	$5.50 – $8.75
Chrome ore, Calif. concentrates, 50% min. Cr_2O_3	ton	22.00 – 23.00
C.i.f. Atlantic seaboard	ton	21.00 – 25.00
Coke, fdry., f.o.b. ovens	ton	5.25 – 5.75
Coke, furnace, f.o.b. ovens	ton	4.00 – 4.25
Fluorspar, gravel, f.o.b. mines' Illinois	ton	23.50 –.....
Ilmenite, 52% TiO_2	lb.	.01½– .01¾
Manganese ore, 50% Mn c.i.f. Atlantic seaport	unit	.40 –.....
Manganese ore, chemical (MnO_2)	ton	75.00 – 80.00
Molybdenite, 85% MoS_2, per lb. MoS_2, N.Y.	lb.	.75 –.....
Monazite, per unit of ThO_2, c.i.f., Atl. seaport	lb.	.06 – .08
Pyrites, Span., fines, c.i.f. Atl. seaport	unit	.11½– .12
Pyrites, Span., furnace size, c.i.f. Atl. seaport	unit	.11½– .12
Pyrites, dom. fines, f.o.b. mines, Ga.	unit	.12 –.....
Rutile, 95% TiO_2	lb.	.12 –.....
Tungsten, scheelite, 60% WO_3 and over	unit	9.50 – 10.00
Tungsten, wolframite, 60% WO_3	unit	8.75 – 9.00
Uranium ore (carnotite) per lb. of U_3O_8	lb.	3.50 – 3.75
Uranium oxide, 96% per lb. U_3O_8	lb.	2.25 – 2.50
Vanadium pentoxide, 99%	lb.	12.00 – 14.00
Vanadium ore, per lb. V_2O_5	lb.	.75 – 1.00
Zircon	ton	50.00 –.....

Non-Ferrous Materials

	Cents per Lb.
Copper, electrolytic	13
Aluminum, 98 to 99%	25–27
Antimony, wholesale, Chinese and Japanese	7½– 7¾
Nickel, virgin metal	27–29
Nickel, ingot and shot	30–32
Monel metal, shot and blocks	32.00
Monel metal, ingots	38.00
Monel metal, sheet bars	45.00
Tin, 5-ton lots, Straits	41 87½
Lead, New York, spot	6.85
Lead, E. St. Louis, spot	6.65
Zinc, spot, New York	6.65
Zinc, spot, E. St. Louis	6.30

Other Metals

Silver (commercial)	oz.	$0 64¾
Cadmium	lb.	.88@.90
Bismuth (500 lb. lots)	lb.	2.55
Cobalt	lb.	3.00-3.25
Magnesium, ingots, 99%	lb.	1.25–.....
Platinum	oz.	116.00
Iridium	oz.	275.00@300.00
Palladium	oz.	80.00
Mercury	75 lb.	62.00

Finished Metal Products

	Warehouse Price Cents per Lb.
Copper sheets, hot rolled	21.75
Copper bottoms	30 75
Copper rods	20 75
High brass wire	19 00
High brass rods	16 75
Low brass wire	20.75
Low brass rods	21 00
Brazed brass tubing	24.00
Brazed bronze tubing	27 00
Seamless copper tubing	25.50
Seamless high brass tubing	24 00

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

Copper, heavy and crucible	9.00@ 9.25
Copper, heavy and wire	11 25@11.50
Copper, light and bottoms	10.25@10.50
Lead, heavy	5.50@ 5.62½
Lead, tea	3.50@ 3.75
Brass, heavy	6.25@ 6.50
Brass, light	5.25@ 5.50
No. 1 yellow brass turnings	6.00@ 6.25
Zinc scrap	3.75@ 4.00

Structural Material

The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses in the cities named:

	New York	Chicago
Structural shapes	$3.54	$3.54
Soft steel bars	3.54	3.54
Soft steel bar shapes	3.54	3.54
Sft steel bands	4.39	4.39
Plates, ¼ to 1 in. thick	3 64	3.64

Industrial

Financial, Construction and Manufacturing News

Construction and Operation

Arkansas

EL DORADO—The Central States Gas Co., St. Louis, Mo., has acquired the local plant of the El Dorado Gas Co., and plans for extensions and improvements. W. A. Busch is president.

California

SAN FRANCISCO—The Pacific Coast Glass Works, Inc., Irwin and 7th Sts., has awarded a contract to R. J. H. Forbes, Monadnock Bldg., for the construction of its proposed new plant addition, estimated to cost $20,000, and will commence work at once.

SAN FRANCISCO—M. Greenberg Sons, 225 Beale St., operating a brass foundry and plating works, have arranged for the removal of their plant to 765 Folsom St., where additional equipment will be installed for increased capacity.

POMONA—The Pomona Tile Co., recently organized with a capital of $100,000, has acquired a local site on Reservoir St., and will have plans prepared at once for the erection of a new plant for the manufacture of tile products, to be equipped for an initial output of 2,500 sq.ft. of tile per day. Judson F. Clark, Pasadena, Calif., and Bert L. Cooper, Pomona, head the company.

FRESNO—The Richfield Oil Co., Los Angeles, is planning for the construction of a new local distributing and storage plant, estimated to cost $200,000, including equipment. C. M. Fuller is president.

Delaware

WILMINGTON—The Tanners' Products Co., Market and A Sts., has filed plans for the construction of a new 2-story building at its plant, estimated to cost $30,000.

Florida

TAMPA—The Melville Fertilizer Co. has acquired property on 7th Ave., and plans for the erection of a new plant for the manufacture of commercial fertilizers, estimated to cost $65,000. B. M. Banker is president.

BRADENTOWN—The City Council has tentative plans under consideration for the construction of a municipal artificial gas plant, utilizing oil as fuel.

Georgia

GORDON—The Gordon Kaolin Co., recently organized with a capital of $145,000, has acquired the local plant and properties of the Columbia Kaolin & Aluminum Co., and will make improvements and extensions to develop a daily output of close to 100 tons washed Georgia china clay. The new company will be affiliated with the Savannah Kaolin Co., Savannah, Ga.

COLUMBUS—The Columbus Brick & Tile Co. has acquired a tract of about 225 acres of land for extensions in its tile manufacturing and brick plant. It is purposed to install equipment for development at an early date.

Illinois

CHICAGO—The S. O. S. Mfg. Co., 2035 Charleston St., manufacturer of cleansers composed of steel wool, soaps, chemicals, etc., has leased space in the building at 3500 South Morgan St., for a term of years, and will remove to this location. Additional equipment will be provided for increased capacity.

CHICAGO—The American Linseed Oil Co., 2209 Lumber St., has awarded a general contract to Seipp & Lonergan, 179 West Washington St., for the erection of a new 4-story plant, 70x110 ft., estimated to cost $80,000. R. H. Adams is president.

CHICAGO—The D. B. Scully Syrup Co., 321 East Illinois St., is planning for the rebuilding of the portion of its plant, recently destroyed by fire with loss estimated at $100,000, including equipment.

CHICAGO—Horine & Bovey, 401 West Superior St., manufacturers of flavoring extracts, etc., are taking bids for the construction of a 3-story addition, 50x100 ft., to cost about $22,000, exclusive of equipment.

Indiana

MISHAWAKA—The La Salle Paper Co., South Bend, Ind., will soon take bids for the construction of a new 1-story and basement mill, 50x400 ft., on local site, estimated to cost $100,000. A power plant will also be erected. Freyermuth & Maurer, Farmers' Trust Bldg., South Bend, are architects. Claude N. Nicely is president.

INDIANAPOLIS—The Indiana Reinforced-Concrete & Culvert Co., 702 Morris St., has commenced the erection of a new plant at 850 South Harding St., to be 90x120 ft., equipped for the manufacture of cement pipe, blocks, etc. The present works will be removed to the new location, and additional equipment installed. E. S. Smith heads the company.

Kentucky

LOUISVILLE—The United States Foil Co., 2934 Grand Ave., will soon take bids for the construction of a new 1-story foundry at 30th St. and Grand Ave., for metal casting production, to cost about $17,000. O. P. Ward, 1501 Lincoln Trust Bldg., is architect. R. S. Reynolds is president.

Louisiana

BROUSSARD—The Billeaud Sugar Factory has commenced the installation of additional equipment at its plant, to include enlargements in the mill from six to nine rollers, crushing equipment, crystallizers, juice heaters, tanks, etc. H. Littell is chemist and superintendent.

MONROE—The Brown Paper Mill Co. is awarding machinery contracts for its new local mill and will place orders for other equipment in the near future. Construction is in progress on the plant, which will be equipped for an output of 50 tons of kraft and similar papers per day. It is expected to be ready for service late in the spring of the coming year, representing an investment in excess of $500,000. George F. Hardy, 209 Broadway, New York, is engineer. H. L. Brown is president.

Maine

BOWDOINHAM—The Sagadahoc Fertilizer Co. has been acquired by new interests and will be reorganized. Plans are under consideration for enlargements, to include the installation of additional equipment for increased output. E. E. Philbrick and Horace F. Dodge, both of Damariscotta, Me., head the new company.

Massachusetts

SPRINGFIELD—The Hampden Paint & Chemical Co., is planning for the rebuilding of the portion of its testing and experimental department, destroyed by fire, Sept. 24, with loss reported at $16,000.

Michigan

KALAMAZOO—The Valley Paper Co., recently organized with a capital of $500,000, has perfected plans for the erection of a new local mill for the manufacture of book papers, estimated to cost in excess of $150,000. George O. Comfort, formerly head of the Monarch Paper Co., is president, and Edwin H. Hacking, secretary and treasurer.

Missouri

KANSAS CITY—The Dean Rubber Co., 13th and Chestnut Sts., is considering plans for the erection of a new 2-story and basement plant at 16th and Charlotte Sts., esti-

mated to cost about $45,000. W. J. Deal is president.

ST. LOUIS—The Excello Mfg. Co., Title Guaranty Bldg., recently organized, will operate a local plant for the manufacture of a line of agricultural chemical products for spraying, etc. Chemicals will be purchased in quantity for manufacturing service, including soda ash, white arsenic, caustic soda, etc. J. J. Steiger is president.

New Hampshire

FRANKLIN—The International Paper Co., 100 East 42nd St., New York, is reported to be planning for the erection of an addition to its local plant.

New York

BUFFALO—The Russell-Miller Milling Co., Minneapolis, Minn., will commence the construction of a new flour-blending mill, 70x72 ft., at Michigan St. and the City Ship Canal, estimated to cost $75,000.

Ohio

LIMA—The Roxana Petroleum Co. has authorized plans for the construction of a new local refinery for the production of lubricating oils, estimated to cost about $300,000, with equipment. It is expected to call for bids late in the present year. Headquarters of the company are at Tulsa, Okla. S. Peterson is chief engineer.

Oklahoma

FAIRVALLEY—The Gyp Valley Plaster Co., recently organized by Dwight C. Spray, Ponca City, Okla., and associates, has plans under way for the development of gypsite deposits in this section. A list of equipment to be installed will soon be arranged.

Pennsylvania

NEW CASTLE—The Shenango Pottery Co., manufacturer of chinaware, has work in progress on additions to its plant for large increase in output. A number of buildings will be erected, with total of twenty-five kilns and auxiliary equipment. Additions will be made in the working force.

PHILADELPHIA—The Gorgas-Pierie Mfg. Co., 144 East Allen St., manufacturer of cottonseed oil, etc., has work in progress on extensions and improvements in the plant of the American Agricultural Chemical Co., Delaware Ave., recently acquired, and plans to commence operations at an early date. The company is developing a system for discharging copra by means of suction apparatus and will install tanks and auxiliary equipment for this purpose.

PITTSBURGH—The Pittsburgh Paint & Supply Co., 903 Liberty Ave., has completed plans for extensions and improvements in its plant to cost about $45,000.

PHILADELPHIA—Delaney & Co., Cottman and Milnor Sts., manufacturer of glue, etc., has awarded a general contract to the A. Raymond Raff Co., 1635 Thompson St., for the erection of an addition to its plant to cost about $60,000. Work will be commenced at once.

BEAVER FALLS—The Beaver Falls Art Tile Co. is completing the erection of a new plant, on which work was commenced a number of months ago, and purposes to have the unit equipped and ready for operation at an early date, providing a total plant area of 180,000 sq.ft. It will be used for the production of white glazed tile.

South Carolina

GREENVILLE—The Pittsburgh Plate Glass Co., Frick Bldg., has tentative plans for the establishment of a new branch plant in this section. A number of sites are now under advisement.

Texas

FORT WORTH—The Roe Nichols Oil Co., Oklahoma City, Okla., has plans under way for the construction of a new refining plant on local site for the production of lubricating oils. It is purposed to commence work in about 90 days. The refinery will cost close to $100,000, with machinery.

BROWNWOOD—The Dixie Gasoline Co. is completing the construction of a new gasoline-refining plant in the North Brown County field, and plans to place the unit in service at an early date. It will be equipped for an initial output of 7,000 gal. per day.

MIRANDO CITY—The Misko Refineries, Inc., has preliminary plans for the construction of a new oil-refining plant, with initial capacity of about 1,500 bbl. per day. It is estimated to cost approximately $200,000, including machinery. O. W. Kilam is president, and S. P. Coblentz, plant superintendent.

HOUSTON—The Texas Portland Cement Co. is planning for the installation of additional equipment at its plant in the Buffalo Bayou district, including a new kiln for increased capacity.

Washington

VANCOUVER—The Columbia River Paper Mills, Inc., will commence the construction of its proposed new addition, for which a general contract recently was awarded, to consist of a main paper mill unit, 80x380 ft., estimated to cost about $90,000. William Du Bois is vice-president.

West Virginia

PARKERSBURG—The City Council has called a special election on Oct. 30, to vote bonds for $250,000, for the installation of a filtration plant at the municipal waterworks.

PARSONS—Negotiations are under way for the purchase of the local plant and property of the Parsons Pulp & Paper Co., for a consideration of $337,117, by new interests, which purpose to reorganize the company, it is stated, and operate the plant. The works are now under the direction of Arthur J. Stevens, receiver for the Parsons company.

NEWELL—The Homer Laughlin China Co. is pushing construction on its new pottery, to be known as the No. 6 plant, and purposes to have a portion of the works equipped and ready for operation early in the coming year. Work is now in progress on the bisque and decorating kilns. The H. K. Ferguson Co., Cleveland, O., is the general contractor.

NEW CUMBERLAND—The New Cumberland Glass Co. has awarded a general contract to the Truscon Steel Co., Youngstown, O., for the rebuilding of the portion of its plant recently destroyed by fire, and work will be placed under way at once. The new structure will cost about $25,000, exclusive of equipment. F. E. McElfresh is general manager.

KEYSER—The Common Council is perfecting plans for the installation of a filtration plant in connection with a new waterworks system, estimated to cost $175,000.

Wisconsin

MILWAUKEE—The North Milwaukee Foundry Co., Commerce Ave., is taking bids on a general contract for the construction of an addition to its foundry.

Opportunities in the Foreign Trade

Parties interested in any of the following opportunities may obtain all available information from the Bureau of Foreign and Domestic Commerce at Washington or from any district office of the bureau. The number placed after the opportunity must be given for the purpose of identification.

BONES, steamed and otherwise. Antwerp, Belgium. Purchase and agency.—7818.

PAINTS. Dublin, Ireland. Purchase.—7865.

PHOSPHORUS; red, amorphous, sesquisulphide. Okegem, Belgium. Purchase.—7835.

ROSIN. Christiania, Norway. Purchase.—7856.

ROSIN. Stettin, Germany. Agency.—7863.

ROSIN, first quality, in lots of 10 to 20 tons. Basel, Switzerland. Purchase.—7815.

TALLOW, No. 1 prime packer, or extra. Matanzas, Cuba. Purchase.—7805.

LARD. Antwerp, Belgium. Agency.—7872.

LARD, best quality, 10 tons as sample shipment. Vienna, Austria. Purchase.—7853.

MACHINERY, copper rock ore concentrating machinery. Santo Domingo, Dominican Republic. Purchase.—7803.

MATCH-MAKING MACHINERY. Saarlouis, Germany. Purchase.—7833.

CEMENT, white artificial portland. Rotterdam, Netherlands. Purchase.—7810.

CEMENT AND ROOFING MATERIALS. Dublin, Ireland. Purchase.—7811.

LUBRICATING GREASE. London, England. Agency.—7817.

PARAFFINE for industrial purposes, 10 or 20 tons. Basel, Switzerland. Purchase.—7844.

New Companies

EASTERN MICA CO., Boston, Mass.; mica products; $25,000. Joseph F. Haley is president, and James F. Quinn, 69 Thorndyke St., Cambridge, Mass., treasurer.

COSBY PRODUCTS CO., 549 Fulton St., Chicago, Ill.; metal polishes, cleaners, etc.; $25,000. Incorporators: M. M. Rueping and William D. Kerr.

JERNAGAN TAR & TURPENTINE CO., Milton, Fla., tar products, turpentine and kindred specialties; $25,000. Incorporators: Carl H. and W. O. Jernagan, both of Milton.

PETTIT PAINT CO., Jersey City, N. J.; paints, varnishes, etc.; $100,000. Incorporators: George S. Wing, Otto C. Miller and John L. Pettit, 10th and Grove Sts., Jersey City. The last noted is representative.

LAMESA COTTON OIL CO., Lamesa, Tex.; cottonseed oil products; $25,000. Incorporators: C. S. McCormick, O. W. Jones and J. P. Cole, all of Lamesa.

RIGGS CHEMICAL LABORATORIES, INC., Brooklyn, N. Y.; chemicals and affiliated products; $500,000. C. B. LaFoyard, 505 Times Bldg., New York, is the principal incorporator.

M. N. S. PAINT MFG. CO., Minneapolis, Minn.; paints, varnishes, etc.; $150,000. Incorporators: A. F. Swanson, Charles Hoeghm and C. R. Mosiman. Representative: Corporation Trust Co. of America, du Pont Bldg., Wilmington, Del.

DUNHAM-WATSON CO., 441 South Dearborn St., Chicago, Ill.; printing inks and kindred products; $25,000. Incorporators: LeRoy Hackett, H. M. Callahan and F. W. Simonds.

TOBE MFG. CO., Pittsburgh, Pa.; rubber products; $100,000. Incorporators: Louis Tobe and Hanfred Feitler, both of Pittsburgh; and Gerl C. Murphy, Sewickley, Pa. Representative: Capital Trust Co. of Delaware, Dover, Del.

NAPTHA PRODUCTS CORP., Hoboken, N. J.; cleaning fluids, etc.; $125,000. Incorporators: James L. Burke, James W. Wallace and Harry P. Diggs. Representative: George A. Enright, 53 Newark St., Hoboken.

DIXIE PAPER MILL CORP., Norfolk, Va.; paper products; $25,000. Incorporators: C. A. Long and E. R. Wilcox, both of Norfolk.

PEQUOT OIL CO., Boston, Mass.; refined oil products; $360,000. Edward C. Mason is president, and Allen T. Rogers, Brookline, Mass., treasurer.

HAMILTON BEACH MFG. CO., Waterbury, Conn.; metallic compounds, etc.; $50,000. Incorporators: Edward O. and John H. Goss, and Leavenworth P. Sperry, 145 Buckingham St., Waterbury.

CONNOLLY CO., INC., Wilmington, Del.; chemicals and chemical byproducts; $820,000. Incorporators: A. M. Gorman, C. R. Mudge and Edward F. Johnston, all of Wilmington. The last noted is representative.

ANDERSON COTTON OIL CO., Anderson, S. C.; cottonseed oil products; $50,000. Incorporators: W. C. Gilmer and J. F. Shamute, both of Anderson.

MONTGOMERY OIL WORKS, 25 Delaware Ave., Jersey City, N. J.; organized; oil products. Paul F. Cullum and Henry A. Kenyon head the company.

CHARLES R. SHOEMAKER, INC., Philadelphia, Pa.; fertilizer products; $50,000. William F. Bispels, 120 East Rockland St., Philadelphia, is treasurer.

MISSOURI RUBBER PRODUCTS CO., St. Louis, Mo.; rubber tires, tubes, etc.; $13,750,000. Representative: Corporation Trust Co. of America, du Pont Bldg., Wilmington, Del.

STERLING OIL PRODUCTS CO., St. Marys, W. Va.; refined oil products; $50,000. Incorporators: J. T. Flynn, Sistersville, W. Va.; and T. S. Tarbox, Oil City, Pa.

ROY PAPER CO., INC., Fall River, Mass.; paper products; $100,000. Joseph Morency, president, and Philippe J. Roy, 87 Barre St., Fall River, treasurer.

SANITARY LIQUID SOAP & SUPPLY CO., Philadelphia, Pa.; soaps and kindred products; $25,000. Representative: Corporation Guarantee & Trust Co., Land Title Bldg., Philadelphia.

JACOBS LABORATORIES, INC., Washington, D. C.; chemicals and chemical byproducts; $250,000. Incorporators: Benjamin R. Jacobs, Daniel R. Forbes and Richard D. Daniels, Washington. Representative: Capital Trust Co. of Delaware, Dover, Del.

PETROLEUM LABORATORIES, INC., New York, N. Y.; petroleum products; $200,000. J. G. Deane, 15 Park Row, New York, is the principal incorporator.